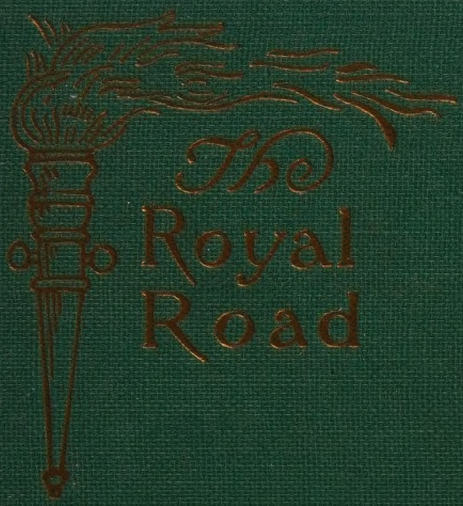
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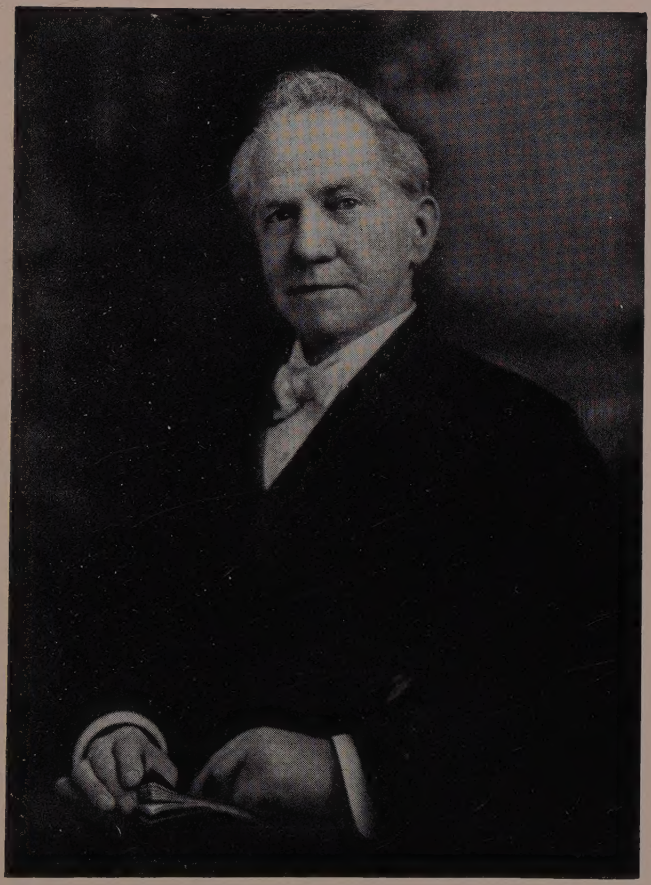
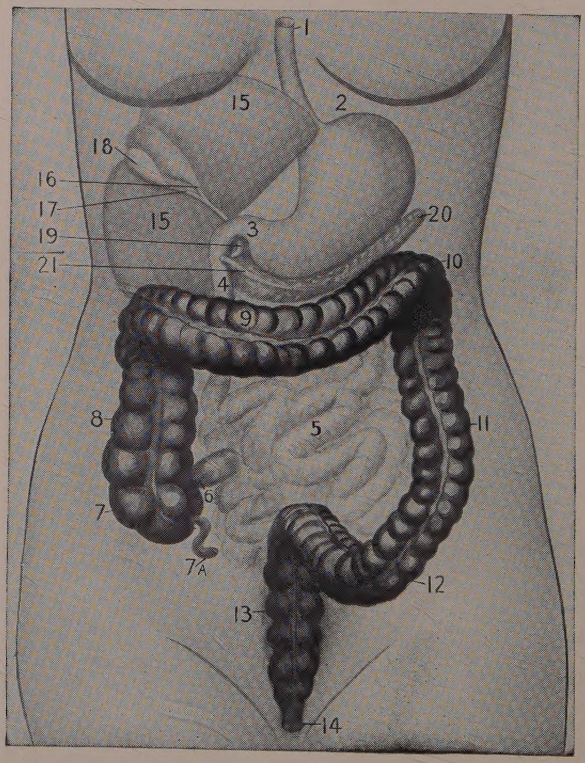


Chas. A. Symmes

DIGESTIVE ORGANS OF MAN

See Page iii for Description of Diagram



DIGESTIVE ORGANS OF MAN

See Page iii for Description of Diagram

The above shows plainly "the normal colon."

A proper study of this picture will not only prove extremely valuable and instructive. but inspire respect and reverence for the wonderful construction of the human body.

EXPLANATION OF THE DIAGRAM OPPOSITE

1. Esophagus or Gullet.
2. Cardiac end of Stomach.
3. Pyloric end of Stomach.
4. Duodenum.
5, 6. Convolutions of Small Intestines.
7. Cæcum.
7a. Vermiform appendage of Cæcum, called the *appendicula vermiformis.*
8. Ascending Colon.
9, 10. Transverse Colon.
11. Descending Colon.
12. Sigmoid Flexure, the last curve of the Colon before it terminates in the Rectum.
13. Rectum, the terminal part of the Colon.
14. Anus, posterior opening of the alimentary canal, through which the excrements are expelled.
15. Lobes of Liver, raised and turned back.
16. Hepatic Duct, which carries the bile from liver to Cystic and Common Bile Ducts.
17. Cystic Duct.
18. Gall Bladder.
19. Common Bile Duct.
20. Pancreas, the gland which secretes the pancreatic juice.
21. Pancreatic Duct, entering the Duodenum with the Common Bile Duct.

THE ROYAL ROAD

by

E. J. BORZILLERI
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REVISED EDITION

TYRRELL HYGIENIC INSTITUTE, INC.
Founded in 1894 by CHARLES A. TYRRELL, M.D.,
Originator of the "J. B. L. Cascade Internal Bath."
152 WEST 65TH STREET, NEW YORK

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PREFACE
to the
THREE HUNDRED AND NINETY-FIFTH
EDITION
of
THE ROYAL ROAD

A MESSAGE of Health—still preaching its message of health and life—this three hundred and ninety-fifth edition of THE ROYAL ROAD has been entirely rewritten and brought up to date. In fact, it is more than a revision—it is an original and new book.

Thousands upon thousands of men and women have read, pondered and followed the advice contained in previous editions—and have been happier and healthier in consequence thereof.

We believe that this new Royal Road will prove even more valuable a guide. It contains a vast deal of new information. For instance, there is a very full discussion of VITAMINS and their importance in maintaining a constant level of good health. ALLERGIC ACTION is summarized in detail because, as all physicians will testify, this subject is of far-reaching importance in solving many questions of specific diet—of utmost significance, too, in the diagnosis of many a condition whose mysterious origins have been hitherto baffling and obscure. BATHS and their significance in the maintaining of a uniform level

of well-being are treated at great length, together with the related subject of HYDROTHERAPY.

Naturally enough, the whole principle and practice of Internal Bathing is set forth in complete and lucid detail. As the years go by, the underlying truth and rationality of this treatment for the relief of constipation and autointoxication, with their frequent and many attendant ailments, becomes more important.

Not only has the burden of testimony from added thousands of J. B. L. Cascade users become greater and more impressive through the years but, in addition, added insight upon its undoubted therapeutic value has been gleaned from a wide range of medical and scientific evidence.

This edition of THE ROYAL ROAD is an effort to present a plan of living, so designed and so organized in its arrangements—so authentic in its information—that anyone can follow its advice with the almost sure conviction of obtaining a new outlook on life—an outlook which is bracing to the spirit, tonic to the mind, healthful to the body.

Permit us once more to thank our many friends—old and new—who have so generously helped to spread the gospel of "internal health through Internal Bathing"—Joy, Beauty and Life through the use of the J. B. L. Cascade.

(*Signed*) STEPHEN L. PALMER,
President, Tyrrell's Hygienic Institute, Inc.

New York City.

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The following highly interesting and scholarly article appeared in the "New York Globe," of January 27, 1916:

THE COLONIC

By Dr. Frank Crane

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A colonic is a person afflicted with bacilli in the colon.

A striking phase of modern medical science is the amount of attention being devoted to the colon and its toxic contents.

The present age, and the one just passed, regarded alcoholic intoxication as its chief crime breeder, body wrecker, and soul destroyer. The coming age will address itself to the much more common, insidious, and deadly poison that comes from the colon.

The esoteric believer attributes all diseases of body and troubles of mind to error. The scientist knows that these little errors can be raised by the quart in the laboratory, and can propagate prodigiously in the human intestine.

The colon drunkard is harder to live with than the saccharomyces drunkard (alcohol)

Colonics break up happy homes as much as do alcoholics.

The man whose excretion is imperfect is irritable. He imagines other people irritate him because he cannot conceive how he can be naturally so mean.

Misunderstandings between parent and child, husband and wife, employer and employed, are due to constipation as much as to any other cause. People poisoned by colon bacilli are not their natural selves. They are as irresponsible as whiskey soaks. It is folly to punish them; they ought to go to a doctor.

A great deal of what we call Sin is due to what the physician calls stasis—an imperfect movement of the intestinal contents. A person may have the highest ideals, the purest aspirations, the noblest intentions; he may be a devotee of uplift literature, he may be instant in prayer and earnest of spirit, and yet wonder why gloom, depression, and fear constantly assail him, and he often as not does not realize that his trials are due to a clogged colon and not to any spirit of evil.

If he would get the colon bacilli out of his system his terrible temptations would disappear.

If you would know why domestic friction exists, why children are bad, why boys run away from home, why girls seem sometimes possessed of the evil one, why business relations become intolerable, why workmen cannot get along together, why there is dissension in the church, why perfectly sane and sober folks suddenly develop the most outrageous cantankerousness, the cause is not in original sin nor the influence of psychic current; it is more likely to be found in the vicious company of militant bacilli in the colon.

The colonic is the real "hunter for trouble." He craves trouble as a drunkard in his cups.

"The colonic," says Dr. Morris, "tries first one way and then another to get an irritated response to an irritating question or assertion. He eventually brings upon himself almost any calamity that he fears, through the influence of persistent suggestion."

The individual with his colon full of bacilli is conscious of a vague discomfort, and often takes to drugs, such as alcohol, morphine, or cocaine. He seeks relief much as one scratches the skin where it has been stung by nettles.

There is a vast deal of moral and religious work physicians might do if they would induce people to cleanse the colon as well as the body surface.

The first requisite to sanctity is to keep the intestines open.

CHAPTER I

THE ROYAL ROAD

ARE you joyously swinging along the ROYAL ROAD —the path to health? Or are you plodding, stumbling along the bumpy by-roads that lead to ILLNESS? Whichever you are, we are bringing you, as an individual, this personal Message of Health.

If you are traveling along its Royal Road, we want to tell you how you can keep there. It is all too easy to make a false turn when your attention is diverted by your companions or your surroundings, and to find yourself lost in the bewildering maze that leads only to illness. And if you have lost the Royal Road, we are going to tell you how, with a little patience, you may regain it.

HEALTH IS POSITIVE. Don't let the dictionary fool you into believing that it means "the absence of illness". *Health is that very positive quality which enables you to get all you can out of life.* It is not a goal in itself—simply a means towards a goal—and the goal is Life.

And Life is not mere existence. Life means using to its fullest capacity every physical and spiritual endowment Nature has given you. Life means the joys of love, of companionship, of parenthood; it means the happiness and content that come with work well done and it means the carefree spirit of

play. It means the fulfillment of your most cherished dream, whether it be marriage, children, your own little home in the suburbs, a trip to Europe, an ermine wrap or the political or social leadership of your community.

So we may say that Health is the means of getting all the fun out of living—fun that is rightfully yours. Health means Life itself.

All the human interests we have just listed present a pretty wide range of activity, yet they all have a common denominator—Energy. Everything we do requires energy. Indeed, the mere act of living requires the expenditure of energy. Hence Energy may be called the basic principle of life.

Now energy means the output of work. The fuel which gives us our energy is the food we eat, just as the gasoline is the fuel which makes the wheels of your automobile go round.

The food we eat is not directly converted into energy. It must first be digested, absorbed and finally assimilated by the various parts of the body. It is then burned in the presence of oxygen taken from the Air we breathe, energy and heat being liberated.

But not all the food consumed is converted into energy. Some of it is used to build new and to repair old tissues. While these processes are going on all the time it is during Sleep that most of the reparation is carried on. It is principally for this purpose that Nature has granted us the boon of Sleep.

And back of everything we find as the ultimate source of energy the Sun, worshipped the world over by primitive folk as the Giver of Life. It is through the action of the sun's rays that plants are able to

make starches and sugars that we consume either in the form of vegetables and fruits or ultimately in the form of meat. It is the sun that gives us Vitamin D and it is its warmth that rejuvenates both the well and the sick. Small wonder that it is worshipped as a god!

Thus we see that the body is the theater of constant change. The processes of breaking down and building up, the liberation of energy and heat continue without intermission during life. During every moment of life waste is being formed by the destruction of tissue. It is imperative that this effete material be properly removed if you want to partake of the joys of good health.

Nature has provided adequate means for the removal of these waste substances, the retention of which obstructs and irritates the complex mechanism of the human system. The principal agents for the expulsion of waste matter are the lungs, the skin, the kidneys and the intestinal canal.

The intestinal canal is particularly important, since by it the waste products of digestion are expelled. If it fails promptly to fulfill its office, every vital function is interfered with; and the waste is reabsorbed directly into the circulation. The residue hardens. This process, known as constipation, goes on from day to day, week to week, month to month, until not infrequently it happens that the colon becomes distended to several times its normal size. Not only is it impossible to estimate the evil caused by the reabsorption of waste poisons from the impacted feces, but it is impossible to estimate the evil caused by an engorged colon monopolizing two or three times its al-

lotted space in the abdominal cavity, crowding and hampering the other organs in their work.

Hence Internal Cleanliness is just as vitally important, if not more so, than External Cleanliness. Strange it is indeed that it has been so neglected in the teaching of personal hygiene to the young. All of us have childhood memories of vigorous behind-the-ear washings, reprimands for coming to the dinner table with dirty hands, dreaded Saturday night baths and other manifestations of external cleanliness. But few of us, I vouch, remember definite preachments on internal cleanliness. The castor oil bottle didn't appear until we refused to eat or pulled sister Susie's hair. Then it seemed to be a punishment pure and simple and not a corrective.

But no matter how careful you are about cleanliness, about diet or any of the other factors contributing to good health, health cannot be yours without Exercise. It is exercise that helps the blood vessels to bring nourishment to the various parts of the body and to carry away the waste products. And it is exercise that strengthens the tone of the muscles so that the organs dependent upon them for their functioning can carry on their work efficiently.

And so we have a picture of the human mechanism —greedy in its demands, yet awesomely beautiful— drinking in the fresh air, reaching for the sunshine, partaking of animal and vegetable at its will—all for the sake of doing what it wants—for the sake of life.

And as fast as the human mechanism absorbs these life-givers, it gives them off in the form of energy, heat and waste matter. Greedy, too, that it is, it is exacting to the point of finickiness. Neglect to give

it the sunshine, the air and food, neglect to rid it of waste and it will refuse to work.

Ironically enough, whether you take care of your mechanism or neglect it, old Mother Nature sends you sleep, or withholds it when you crave it most. Just a reminder—and a not too gentle reminder—that she is all supreme and her laws must be obeyed.

These laws—and we have mentioned them all—are the Laws of Health: Fresh Air, Sun, Right Diet, Exercise, Sleep and External and Internal Cleanliness.

Consider them the traffic laws you must obey if you want to travel along the Royal Road. And remember, your greatest enemy is that state trooper, Intestinal Stoppage, always lurking in the shadows of a cross road to catch you if you break a law.

And now we are ready, in the following chapters, to give you in detail the rules and regulations of the Royal Road to Health.

CHAPTER II

THE SUN AND THE AIR

THE Sun, we have said, is the Giver of Life. As such he has been worshipped by primitive peoples since the world began. And not only by primitive folk—the highly civilized Egyptians, Babylonians, Greeks and Romans worshipped the Giver of Life.

As Apollo, the sun had more influence upon the Greeks than any other god; it is not an exaggeration to say that the Greeks would not have become the glorious people they were without the worship of Apollo. Apollo was more than the giver of Life. Swiftly and ruthlessly with his arrows he could bring death and pestilence when he was angered. And when appeased he was the god of Medicine, the kindly Healer.

We no longer worship the sun, but more than ever we are aware of its influence on all life. We know that its rays stimulate the growth of every living thing, and there is no doubt but they exert a chemical action upon living tissue with which we are as yet imperfectly acquainted.

But we do know that through the action of the sun's rays certain elements in plants are converted into starch and sugar which are necessary for the building of tissue and, above all, for energy. Whether we consume the starch and sugar directly in the form

of plants or indirectly in the form of meat, the sun is ultimately responsible.

The sun is our source for vitamin D, so necessary for the prevention of rickets. While we may get this "sunshine" vitamin from food, such as milk, we also get it directly from the sunshine. The rays of the sun, falling upon the skin, convert the tiny deposits of ergosterol—a substance found in all animal tissue —into the vitamin.

In addition, the sun has a curative and rejuvenating power which is not quite clearly understood, although physicians make use of it through artificial sunlight (ultra-violet and infra-red lamps) as well as through the natural rays. It improves the function of the skin, the nerve action and the nutritional processes; and it enriches the blood.

It is because of these health-giving powers of the sun that our winter resorts are now liberally supplied with sun parlors in which those in quest of health may enjoy the rejuvenating effect of sunshine without exposing themselves to the inclemency of wintry weather. This is a revival of an old Roman custom, for the more opulent of that nation had sun baths on the roofs of their dwellings, the modern counterpart of which are the terraces of penthouses.

For nervous debility and insomnia there is no treatment comparable to rest in sunshine. If a patient is bedridden, draw the bed to the window and let the patient lie in the sun for hours. There is no tonic like it—provided the good effects are not neutralized by ill feeling. To restore a withered arm, a palsied or rheumatic limb, or to bring a case of nervous prostration speedily up, a most efficient part of the treatment

is to expose the patient or at least the limb to the direct sunlight as many hours as possible. Many forms of tuberculosis, too, seem benefited by exposure to the sun, although in recent years its efficacy in lung conditions has been questioned.

But whether you are in good health or in poor, if you are not accustomed to the sunlight—and this applies to most of us who live in the temperate zone, for we must bundle ourselves up very closely in the winter—you must avoid long direct exposure at first. Sunburn, headache, sleeplessness, even fever are sure to follow if you don't. Gradually increase the amount of body surface exposed and the length of time spent in the sunshine.

Keeping this in mind, seize the full enjoyment of it whenever opportunity offers. It is a stimulant and tonic that has no superior.

The next great health agency is Fresh Air. Perhaps we should class it as the most important, for without air your hours would be quickly numbered. Air is a vital necessity to the human organism, and the fresher the better—it cannot be too fresh.

The oxygen in the air may be called the "vitalizing" element. This is because the energy stored up in the food which we assimilate requires oxygen in order to be liberated or burned up and then utilized. In other words, by the addition of oxygen, the potential energy which we originally acquired from the food we eat, is transformed into motion, into heat or the functional activities of the glands.

The oxygen is carried to the various parts of the body by the blood stream. The blood corpuscles, when they enter the lungs, through the capillaries (the

smallest of the blood vessels) are charged with carbonic acid gas, or carbon dioxide, as it is more popularly called. Now this carbon dioxide that is brought to the lungs is a waste product of the activity of our tissues, just as the feces are the waste products of digestion. And just as the fecal matter must be expelled because it is poisonous to the system, so must the carbon dioxide be expelled for the same reason.

The expulsion takes place through the same capillaries in the lungs. And after the carbon dioxide has been expelled in the process of exhaling, the blood corpuscles, from the oxygen-laden air that has been inhaled, immediately absorb the oxygen for which they have a wonderful affinity. The oxygen is at once carried to the heart, and by that marvelous pumping machine is sent pulsing through the arteries to be used in the creation of energy.

When it is taken into account that the lungs of an average-sized man contain upwards of six hundred millions of minute air cells, the surface area of which represents many thousands of square feet, the danger of exposing such a vast area of delicate tissue to the action of vitiated or impure air can readily be estimated. No matter how nutritious the food may be that is taken into the stomach, no matter how perfect digestion and assimilation, the blood cannot be vitalized without fresh air and hence the various life processes cannot be performed adequately by their respective organs.

It is estimated that the blood is pumped through the lungs at the rate of eight hundred quarts per hour, and that during that period it rids itself of about thirty quarts of carbon dioxide and absorbs

about the same amount of oxygen. Think for a moment of the madness of obstructing this interchange of elements which is perpetually going on and upon which life depends!

But the amount of carbon dioxide is not the only "badness" in air. Indeed, experiments have shown that as much as twenty parts of this element to 10,000 in the air is not unhealthful. Improper temperature, too much or too little moisture or humidity, as well as lack of movement in the air—all so frequently found in our homes—are equally if not more dangerous. While we cannot regulate the weather, we can regulate the air indoors, nor does it require elaborate devices or "systems" to do so.

Generally speaking, a temperature of about 68 degrees F. is the most healthful room temperature. No hard and fast rule can be made, however, because some persons, usually the less robust, feel better in a slightly higher temperature; and frequently persons who are bustling about prefer a slightly lower one. In any case, it is always wise to keep a thermometer handy and regulate the temperature accordingly.

The air should be neither too dry nor too moist. A room heated by hot water or steam rather than by hot air usually has the right amount of moisture. However, if you do have the latter type of heating system, such simple devices as pans filled with water or Turkish towels wrung out in water and placed over the register will furnish sufficient humidity.

The best and simplest way to keep the air moving is by what is known as "cross-ventilation"; that is, two or more outlets—doors or windows—opposite or nearly opposite each other are kept open. The open-

ings need not be large—indeed, smaller ones are usually better, since there is less danger of a "draft".

At no time is fresh air and proper ventilation so important as during sleep. It is so important that we have devoted several pages to it. You will find them in the chapter on Sleep. If you like, turn to them now.

All the freshest air and all the best ventilation in the world would do you no good unless you utilized them. The way to utilize them, of course, is by breathing—by inhaling and exhaling—properly. First of all, proper breathing means breathing through your nose, and not through the mouth. When you breathe through your nose the tiny hairs in the nostrils catch many of the particles of dust and soot which are inhaled along with the air. In this way the air is filtered or purified to a certain extent. In the second place, the air is warmed in the longer passage through the nose.

There is another good reason for nose breathing, too. Mouth breathing has a tendency to make the lips thick and shapeless and the jaw weak and "hanging". So, if you're a man and want to have a firm mouth and chin, be a nose-breather; and if you're a woman and yearn for cupid's bow lips and a *single* rounded chin, likewise be a nose-breather.

In the second place, proper breathing means filling your lungs to their fullest capacity. This is done by drawing deeply of the air, until you feel that your lungs are full, but *without any straining*. Many persons have the idea that they must inhale so deeply that in a few minutes they are panting for breath, or feel headachy and dizzy. This is far from the truth. Anything that causes discomfort to your body is certainly harmful.

The chest, moreover, should expand naturally over its entire area. It is only in this way that every part of the lungs will be exercised and made more resistant to respiratory diseases. Here again many people, realizing that chest heaving is all wrong, go to the other extreme and breathe with only the lower part of the lungs, using only the diaphragm. If you fill your lungs easily and naturally, the degree in which your chest heaves and your diaphragm bulges will take care of itself.

If you feel that you have not been breathing correctly or that your lungs need exercise, turn to the chapter on Exercise and you will find some simple but very useful breathing exercises.

The benefits of the Sun and Air cannot be overestimated, but if you are constipated, if your intestines are clogged with poisonous wastes, they are of little avail. Your system must first thoroughly be cleansed by "flushing the colon". Then, and then only, can you set out on the "Royal Road" to health.

CHAPTER III

EXERCISE

Do you know of any more delicious feeling than the one which glows through your whole body when you sink into a comfy chair after a brisk work-out or sit down to enjoy a piping hot meal? I'm sure I don't. And if you're anything like me, you feel as if you could conquer the world. But you'd be a kindly conqueror—so pleased you are with the world and with yourself.

We all exercise for the sheer joy of it. But this joy isn't the same as the one we experience when we see our favorite movie star come out on top. It is far more fundamental than that. Consciously or otherwise, we realize that we are doing what Nature has intended us to do—what all animal life must do. For motion is necessary for life—it is more—it is Life itself.

The health of both mind and body depend upon motion. Inaction means stagnation, and stagnation means ill-health and eventually death. Hence the necessity for exercise. As it has oft been stated, disuse is as fatal to a piece of machinery—whether man or man-made—as excessive use is; in fact, both can and are quite likely to rust out rather than to wear out. Activity is essential to life and health, and can never be harmful, provided that moderation—moderation for your own particular constitution—is observed and the muscular system is not strained or overworked.

There are thousands of miles of minute tubing in the human body—the arterioles, veins, capillaries and lymphatic vessels. They ramify through every portion of the tissues, the first carrying the vitalized blood for nourishment of the parts of the body; the second returning the impure blood, charged with the waste of the structures; the third being the intermediary stage between the first and second; while the fourth and last, the lymphatic vessels, collect the surplus nutrition and return it to the circulation. In addition, the lymphatics assist in the conveyance of effete matter. Whenever disease germs are present in the system, they first manifest themselves in the lymph, but this fluid, being densely populated with phagocytes, that is, germ-destroying white corpuscles, the micro-organisms are speedily destroyed if the body is in a healthy, vigorous condition.

In view of the vital character of these body fluids, the activity of motion is indispensable for the best performance of their separate functions. It is exercise that supplies the desired stimulus. Whenever a muscle is contracted the blood is wholly or partially expelled from it, depending upon the force of the contraction, and in its escape it carries with it the waste material. But as soon as the muscles are relaxed, fresh blood from the arterial supply re-enters the structure, bearing fresh nutrition.

By a wise provision of Nature, the amount of nutrition is always in excess of the waste products removed; that is, all things being equal, the more exercise a part is subjected to, the more nutrition it receives. This explains the unusual development of certain parts of the body, such as the legs or arms,

when they are called into excessive use in certain occupations.

The reason for this is perfectly simple, and may be expressed in two words—unequal nutrition—for the muscles that are unduly exercised appropriate the nutriment that should be equally distributed, so that the neglected muscles become weakened and stiff. Hence, any system of exercise designated to develop the body should be so arranged that every muscle in the body is called into play, thus insuring harmonious development in every direction.

Many persons think of muscular exercise only in relation to the development of their external or skeletal muscles. This is very natural, for the results are more quickly observed on the surface, both by the exerciser and his associates. But exercise has a most beneficial effect on the internal, involuntary muscles and on the vital processes carried out with their aid —on digestion, assimilation, nutrition, elimination. This is because the involuntary muscles, while we cannot exercise them through the will, depend for their tone to a considerable extent on the tone of the external muscles. Moreover, their tone also depends upon a normal amount of healthy, nourishing blood which can only be had if the skeletal muscles are sufficiently exercised. When this is so, the digestive powers work more briskly to prepare the needed nourishment, and the blood circulates more rapidly to carry the material for repair to the parts that need it, so that by moderate physical exercise, judiciously distributed, the whole body is built up and strengthened. The result is a suppleness of frame, perfectly functioning organs

and a clearness of head that make life indeed worth living.

To the invalid, of course, it is idle to talk of active exercise, but there are certain forms of passive exercise accessible to such people. Massage, for instance, which, judiciously administered, will do for the sick, in a modified degree, what active exercise will do for the comparatively well. It will stimulate the circulation in the deeper tissues, and set the various fluids of the body moving in a beneficial manner. There is also a mild form of active exercise which may be practiced by those who have the misfortune to be confined to bed, and that is by tensing the muscles; such as clenching the hands and contracting the toes, also by gentle contraction of the arms and legs alternately.

If we could live in accordance to the laws of Nature, most of our exercise would be done outdoors, in the sunshine and fresh air, and it would not be done with the conscious idea of exercising for the benefits derived therefrom, but merely as a medium for work and play. Unfortunately, our lives are so ordered in this modern machine age, that most of our exercise is performed principally or for the sole purpose of maintaining a normal muscle tone and the consequent vibrant health. This is particularly true of city-dwellers, but many country-dwellers, especially in the winter, find that exercise, other than their work, is necessary for good health.

So we have two forms of exercise, performed principally for the purpose of maintaining health, although other objects may be involved. The first includes exercise in the form of games performed in competition with others and usually out of doors. The

second includes sets of exercise, carefully devised to bring every muscle into play, and without any element of competition.

While they differ markedly, many basic rules are the same for both of them. So, before discussing the various types of exercise which respectively comprise them, let us point out these basic rules.

First of all, no strenuous, even moderately strenuous exercise should be performed immediately after eating. This is because the blood is drawn away from the stomach during exercise and indigestion is likely to result. The interval between eating and exercise depends upon the amount and kind of food eaten, as well as upon one's particular constitution. To allow an hour to elapse is a good rule, but many find that a shorter interval causes no strain or discomfort, while others have learned through experience that two hours is better. Similarly, it is better to wait a while before eating after such strenuous exercise as tennis or base ball.

In all forms of exercise the clothing should be as light and unrestricting as possible. Moreover, the body should be exposed as much as possible to allow the beneficent rays of the sun to fall directly upon the skin. But on the other hand, don't burn your skin with too much sunshine. Sunburn can be just as serious as a steam or fire burn. Generally speaking, brunettes can endure direct exposure to the rays of the sun better than fair-skinned persons.

Similarly, don't overdo your exercising. If you feel exhausted rather than refreshed and relaxed after exercising, if you find it difficult to catch your breath, or if your heart keeps racing, you may be sure you

have exercised too strenuously. Exercise should leave you with a nice comfy feeling all over your body, a keen appetite and a clear mind. To be sure, if you haven't been getting the proper amount of exercise, your muscles will feel a little stiff and sore at first, but within a short time all soreness will disappear.

Exercise for only a short period at first, and never beyond the point when you start feeling achy. Increase the length and vigor of your exercise gradually. For example, if you are just starting to do a bending exercise and trying to touch the floor with your finger tips, bend down only five times the first day, and increase the number of times by five each day, every other day, or every week, until you can bend fifty times without feeling any ill effects.

And remember this—no set of exercise, no sport or game is going to be really beneficial unless you perform it regularly and frequently. In this respect exercise is no different from any other thing we do for health's sake. You wouldn't think of bathing only once a month, even if you took a whole day off to do it; nor would you eat only once a month, or rid your bowels of the poisonous waste matter clogging it only once a month. This is because you know that the vital processes are constantly being carried on in your body—tissue is constantly being broken down and must be repaired or replaced, daily the indigestible matter left over from the food we eat must be eliminated—and likewise, daily our skin is covered with a film of dirt, dead cuticle, perspiration and oil. In just the same way, we learned, the tissues need to be strengthened by life-giving blood and can only get the proper amount through exercise.

Finally, all exercise must be packed with fun and joy, if you really want to benefit from it. The reasons for this are obvious. It is impossible, no matter how conscientious you are, to exercise with the right amount of zest—with the zest that brings vigor and quickness to your movements, if you are bored. And if you are at all human—and you are—you are sure to skip a day or two of exercise, perhaps even a week.

Psychology influences the value of exercise in even another way. There is really no distinction between mind and body—when distinction is made, it is done largely for the sake of convenience. The functioning of our minds is governed by nerves, blood and other tissues, just as much as the rest of the body. When the mind is sick or worried, it is sure to be manifested in the functioning of the rest of the body. Indigestion, constipation, loss of appetite and many other disorders appear. Similarly, when some other part of our bodies, no matter how remote, is not in good running order, it is sure to be manifested in the state of our minds. We are despondent, irritable, or slow of wit. In other words, a happy frame of mind is conducive to good health, and good health brings a happy frame of mind. So, when you are doing something that you really like to do, something which is simply loads of fun and which you keenly miss if you have to forego the pleasure of doing, it's just bound to make you feel good all over.

And now we are ready for the exercises proper. Whether you are exercising out-of-doors or whether you are going through your setting-up exercises indoors, there are two exercises which must be mastered first of all. If they are not, you will get only half the

pleasure and benefit from your exercises that you rightfully should. These exercises are standing correctly and breathing correctly. To call them exercises may seem rather strange to you, but when once you begin to try to master these arts, you'll certainly agree that they are really exercises.

While they are of equal importance and are equally the basis of all other exercises, the art of standing correctly must be mastered first. Otherwise it is impossible to learn to breathe correctly and exercise your lungs. Hence we shall first consider the art of standing properly.

The Art of Standing Properly

Tomorrow, or today if you can, carefully observe the people about you. Whether you know anything about anatomy or not, you'll instinctively realize that very few are standing correctly. You'll probably be seized with an almost incontrollable desire to push in the stomach of this one, tilt the chin of that, draw back the shoulders of another. Why? Probably because they look so unaesthetic. The correct posture is the beautiful one, and the only beautiful one. Strangely enough, women on the whole, are the chief offenders. They will spend hours in the beauty salon trying to keep the youthfulness of their skin and hair, and yet stiffly wobble about or thump along on high heels. It seldom occurs to them that by standing correctly they will avoid those dreaded double chins and spare-tire waists.

The correct standing position—and few realize this—is a comfortable, easy and graceful carriage, even though at first it might seem awkward. The weight

should rest on the balls of the feet, the shoulders should be drawn back until the back is flat and the head raised with the chin drawn in slightly. The abdominal muscles must be drawn in and the waist line lifted so that it doesn't feel or look as if the upper part of your body was settled into your hips. (See

Wrong
FIG. 1

Right
FIG. 1A

Figs. 1 and 1A.) If you are standing properly, the back of your ears, your shoulder and the arch of your foot will form a vertical line. Get a member of your family or a friend to test your posture with a curtain pole or any stick.

The accompanying illustrations show the difference between the right and wrong posture.

The right position should always be maintained,

whether you are exercising, working or merely standing. This is not only for beauty's sake, but for health's sake as well. It will help you to breathe correctly and will enable your internal organs to keep their tone and to function properly, since they are occupying the position intended for them and hence receive the nourishment that is rightfully theirs.

How to Exercise the Lungs

As we have said, correct breathing is at the basis of every exercise. It is through the lungs that our bodies receive their supply of oxygen and it is through the lungs that a large portion of the body's waste, in the form of carbon dioxide, is eliminated. This exchange of oxygen and carbon dioxide, you will recall, takes place through the blood vessels. Hence the exercising of the lungs becomes one of the most important factors in quickening and stimulating the movement of the fluids, and can be accomplished with a fair measure of success even by the bed-ridden. Every time the chest cavity is emptied by the expiration of the breath, a partial vacuum is created which exerts a tremendous suction power. It is one of the principal forces concerned in the return of the venous blood to the heart, but it also exerts a like effect on lymphatic vessels. Therefore deep breathing is a valuable exercise for those unable to take any other.

It is easy to understand, then, that in commencing the development of the body by any system of physical culture, the first and most important thing to do, together with correct posture, is to develop the lungs. Good lungs and good digestion go together. Before food can be assimilated it must undergo oxygenation.

which is neither more nor less than chemical combustion. Oxygen is necessary for this process. It unites with the carbon of the food which results in oxidation. As the amount of oxygen depends upon the capacity of the lungs and one's ability and effort to fill this capacity, it will readily be seen how much depends upon those organs. We cannot inhale too much oxygen

FIG. 2

(when it is taken in a part of ordinary air), while we can take too much food; therefore, the greater the lung capacity, the better the digestion.

Here are some exercises for developing the lungs and correct breathing:

1. When in the open air, walk erect, head up, chin and shoulders drawn back (see Fig. 2), just as we have described to you, and thoroughly inflate the lungs.

Retain the air for a second or two, then expel it slowly. Practice this several times a day, and even if employment keeps you indoors, take time and go out. It sounds very simple, doesn't it? And it is simple, but like simple things, there is a catch in it—at least for many persons. The correct way to breathe is to fill every part of the lungs, expanding the diaphragm and filling the lower part of the lungs first. Many people

Fig. 3

have the mistaken idea that correct, deep breathing means sudden heaving of the upper part of the chest upward and outward. We hope you are not one of these chest-heavers, for it means that only the upper part of your lungs are being filled with oxygen.

2. The first thing in the morning and the last thing at night, when you have nothing on but unrestricting underclothing, stand with your back against the wall and fill your lungs to their utmost capacity. Then—retaining the breath—tap your chest all over with the open hand. (See Fig. 3.) Do this regularly every morn-

ing and night, gently at first, but gradually increasing the length of time you hold your breath and force of the blows. You will be amazed and delighted to see

FIG. 4

with what strong blows you can whack yourself as your lungs grow stronger and stronger.

3. Stand upright, heels touching, toes pointing forward. Place your hands on your hips, as in Fig. 4, the fingers resting on the diaphragm, forcing out the thumbs. Do this a half dozen times at first, gradually increasing the number.

Women in particular should find this exercise beneficial, for they seldom use this part of their lungs—tight clothing and ridiculous, so-called modish postures

such as the anæmic ugly-looking "debutante slouch" of a few years ago, prevent them.

4. While in this same position, fill the upper part of the lungs full, then force the air down into the lower part of the lungs and back again by alternately contracting the upper and lower muscles of the chest. Do this repeatedly, for, besides being a good lung developer it is an excellent exercise for the liver.

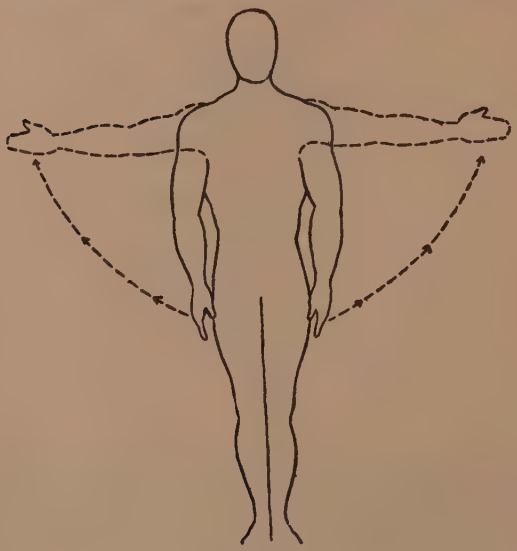

Fig. 5

5. Stand erect, as in Fig. 5, the arms hanging close to the sides. Then slowly raise the arms until they are in the same position as in Fig. 5, at the same time gradually taking in a full breath of air until the lungs are completely filled. Then, after holding the breath for a

few seconds, gradually lower the arms, at the same time slowly expelling the breath. After doing this a few times—while the lungs are full—raise and lower the arms several times quickly.

6. Hold the arms straight (see dotted line in Fig. 6), then slowly throw them back behind you as far as possible, at the same time taking a full breath. Then bring them slowly back to the front, as in the first

Fig. 6

position, expelling the breath while doing so. Do this several times, then fully inflate the lungs, and while holding the breath move the arms backward and forward, in the same way, but quickly. It is important to inflate and empty the lungs fully and completely during this exercise.

Combination Lung and Muscle Exercises

The exercises which we have just described are designed for the purpose of exercising the lungs only, although to be sure some of them also exercise external or skeletal muscles other than those of the chest and diaphragm which are exercised in any type of lung exercise. In addition to these, there are many exercises which combine lung and muscle exercise. Such exercises are of utmost importance as you would undoubtedly discover for yourself if you haven't been in the habit of exercising. Most beginners find it exceedingly difficult to concentrate upon or get pleasure out of exercise whether it is walking, playing golf or doing setting up exercises, if they have to remember their breathing. By practicing combination exercises, in a short time you should be able to breath correctly and easily without giving it any more thought than the fork that is conveying a morsel of meat to your mouth.

Here are a few such exercises. But before you read them, we should like to say that after you have understood and mastered the principle and the object of any group of exercises, you can vary them as much as you like. Indeed, you're sure to find it interesting to originate amusing and intricate performances which you can pass on to your friends and members of your family.

1. First rotate the right arm in a circle, as in the dotted line in Fig. 7, downward in front of you a few times. Then reverse the movement. Next, thrust the shoulder back as far as it will go and rotate the

arm in the same manner. Follow with the left arm in the same manner, then both alternately. Be sure to relax the arms completely, allowing them to become perfectly limp. At the same time inhale and exhale to the fullest capacity of your lungs.

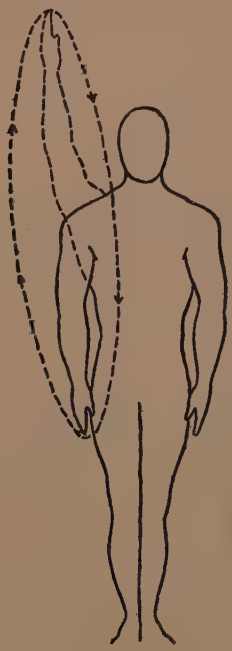

FIG. 7

2. Lie flat on the floor, face downward, with the elbows bent and the palms of the hands flat on the floor by the sides, body fully extended. Then, keeping the body perfectly rigid, raise it up by the muscles of the arms alone, until it only rests on the arms and toes. Then

lower the body gradually until the chest touches the floor, at the same time exercising the lungs to their fullest extent. (See Fig. 8.)

This exercise may be practiced on a bed or couch in the beginning and should be taken slowly at first, until it can be done half a dozen times without discomfort.

Fig. 8

3. Stand erect with your hands on your hips as in Fig. 9. Fill the lungs completely and force the air down into the lower part of the lungs just as we described in Exercise 3 of the *Lung Exercises*. Then, keeping the lower limbs perfectly stiff, with the muscles tense, bend the body forward from the middle of the trunk (see dotted lines in Fig. 9 in front), and while doing this, exhale quickly. Then straighten up again, at the same time filling the lungs again. This should be repeated from 6 to 12 times.

Now repeat the operation, but this time bending backward instead of forward, paying careful attention to the emptying and filling of the lungs. Then, with the lungs full and breath retained, moved the body backward and forward quickly several times.

4. Retaining the same position as in the last exercise, move the upper part of the body to the right a few times, then a few times to the left, after each movement returning to the upright position. Then move in the same manner from right to left, alternately. By

Fig. 9

Fig. 10

referring to Fig. 10 you will readily understand the nature of these movements, which not only benefit the lungs, but impart grace and suppleness to the body.

5. Still retaining the attitude as shown in Fig. 10, press the arms and elbows forward as far as possible, at the same time expelling the breath. Then press them backward as far as it is possible to force them,

at the same time inflating the lungs to their fullest extent. (See Fig. 11.)

Outdoor Exercises and Sports

The ideal way to get one's exercise is, of course, out of doors in the sunshine and fresh air. And the ideal exercises are those which assume the form of play rather than the form of routine exercises similar to those done in the home. The games or sports have, in addition to their effect on the muscles, an important

Fig. 11

psychological value. They give us the companionship which we all crave and furnish us with an incentive to continue our exercises, either because of the companionship they offer us, or because they appeal to the sense of rivalry and honest fighting spirit which we all possess.

Unfortunately all of us are not so situated that we can indulge in sports, and moreover, many of us are not strong enough to indulge in them. It is necessary, we have repeatedly stressed, to select the type and amount of exercise which is suitable to our own particular constitution. Too much exercise or too stren-

uous exercise is just as harmful, and in some cases, even more harmful than no exercise at all.

1. *Walking.* Walking is one of the most pleasurable outdoor exercises and is within the reach of all who are physically able to endure it. Moreover, it is extremely helpful in the correction of constipation, although it cannot be said that it directly involves the abdominal organs, except to a slight degree. Its beneficial effects are obtained partly through the increased activity of the diaphragm and partly by the vibrating effect on the entire body and the stimulation of circulation and metabolism. Moreover, the rhythmical raising and lowering of the body in correct walking gently shakes up the intestines, thereby aiding gas to escape and the solid feces to move gradually downward towards the rectum. Correct walking also helps you to breathe properly.

You are probably wondering just what correct walking is. First of all, in order to walk properly, you must maintain the erect standing posture we have already described. And remember this—just as a correct posture cannot be achieved unless you are wearing sensible shoes, so you cannot walk properly if your shoes don't fit or if they have those ridiculously high heels that so many women think beautiful. Such an idea may be attributed to ignorance. If women would only realize that skinny, shapeless legs, calveless and ankleless, with shortened tendons in the back, are caused principally by high-heeled shoes, they would soon discard such shoes. And if they only knew how men snickered at their ungainly wobbly walks and their hips swaying like elephants'—also due to high heels—they would bury their heads in shame. And if

they realized what those heels are doing to their abdominal organs, they would run straight to their doctor. Fortunately, however, these remarks pertain only to dwellers in large cities where little walking is done.

a. And now for the walking itself. The legs should be swung forward from the hip and *not* from the knee. If you have been walking with a knee movement, perhaps a few preliminary exercises will help you. Here's a simple one that is usually taught to persons preparing for a stage career. Stand erect with your

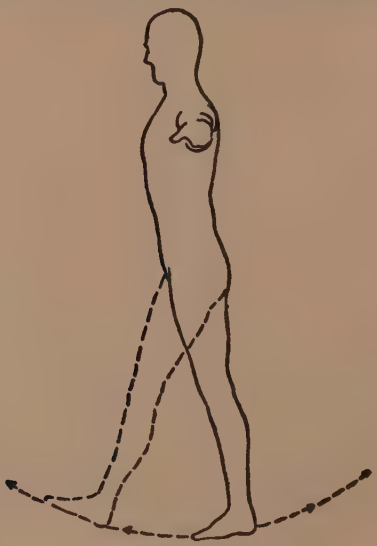

FIG. 12

arms extended shoulder lever at your sides. Now swing your right leg, from the hip, back and forth a few times, then step forward on it, making sure to step on the ball of your foot. (See Fig. 12.) Do the same with your left leg.

b. When you have mastered this exercise, instead of swinging your feet back and forth several times, swing each foot once before stepping, and then modify this movement into a swinging, walking step. You will find that you are walking by swinging your leg from the hip and not from the knee. You will be able to walk a greater distance without tiring, and you will find that you have acquired a most graceful, youthful carriage.

Not only should your legs and general posture be

FIG. 13

taken into consideration when you are walking, but you should also remember your arms. They should swing loosely at your sides and not be held stiffly before you or behind your back. In this position they help rather than hinder correct breathing and posture. (See Fig. 13.)

2. *Running*. Running has the same effect as walking, only more quickly and to a more marked degree. Alternate walking and running is a good exercise and is frequently employed by Boy Scouts on their hikes. The running step may also be practiced either indoors or outside by standing in the same position.

This is sometimes more effective than running forward because it gives one the opportunity to raise the knees up to the chest, thereby exercising the abdominal muscles to a greater extent. (See Fig. 14.)

Running, however, cannot be indulged in by all persons as it is strenuous exercise. If after practicing a short time you find that you are still easily winded

FIG. 14

or your heart keeps pounding, you had better keep to walking.

3. *Sports.* Sports and games are no doubt the best form of exercise there is. We have already told you why so we have no need to discuss the question here. And, as we have also said, it is unfortunate that all cannot indulge in them. But some of us lack the time,

others the facilities and still more are not strong enough.

For those who can indulge in them, horseback riding, golf, tennis, rowing, swimming, squash, hand ball and baseball are all of high value in any system of exercise. Riding and rowing are particularly good for strengthening the abdomen and the back and are helpful in constipation.

Special and Systematic Exercises

For those of us who are not fortunate enough to get our exercise out-of-doors in the form of play, there are many sets of exercises designed to call every muscle into activity which can be performed in the home, without the aid of apparatus. Such exercises have an advantage over games and sports which make them particularly beneficial for those who are generally weak or whose muscles are weak in certain regions, as in the abdomen, for example. They can be better regulated both in length of time and strenuousness than sports and, moreover, can be more definitely aimed at the development of special muscles. Indeed many persons who do indulge in sports find that they feel better and are in better general health if they perform a series of "setting up" exercises every day.

The time selected for such exercises is largely a personal matter. On the whole, however, most people find that if they exercise immediately after arising, they feel much better throughout the day. On the other hand, some find that exercise after working hours or in the evening suits their particular habits and constitutions better. Frequently, they claim, exercise at such time relaxes and refreshes them. Of course,

if you exercise at such times, you must be careful not to do so too near meal time.

FIG. 15

If you like music, you will find that your enjoyment is doubled if you exercise to the accompaniment

FIG. 16

of simple music. A phonograph or radio can be turned on at will, or better still, if you have a musician in

your home, have him play some catchy tune for you in the tempo best suited to the several forms of exercises you are going through.

1. *Arm and Finger Exercises.*

a. Completely relax the muscles of the fingers and hands, letting the hands hang limply from the wrists. Then shake them up and down from side to side, as if cracking a whip. Next rotate them from the wrists, as shown in Figs. 15 and 16. These movements should all be made with great rapidity, the hands being rendered as near lifeless as possible.

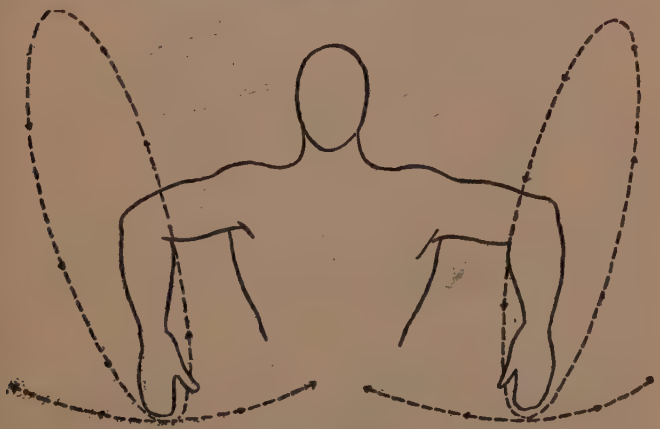

FIG. 17

b. Now, with the upper part of the arm held out at a right angle from the body, and the forearm hanging downward, completely relax the muscles of the elbow. (See Fig. 17.) Then shake and rotate the whole of the forearm in the same manner as described for the hands.

2. *Neck Exercises.* If Figures 18 and 18A are carefully studied, no explanation will be needed. The principal thing to be observed is to keep the body perfectly rigid and use the muscles of the neck only. It is a most valuable exercise and should be carefully and faithfully practiced, particularly by the fair sex, since

FIG. 18

FIG. 18A

it is a sure preventive of double chins and lumps of fat at the nape of the neck.

3. *Hip and Leg Exercises.*

a. Assume the position indicated in Fig. 10, but keep all the muscles of the body (with the exception of the muscles of the hips) perfectly rigid. Now, without bending the knees, bend the body forward as far as you can several times, then backward several times, and finally to each side successively. (See Fig. 19.) Next bend once in each direction and repeat several times, being careful not to relax the muscles other than those

of the hips. Conclude the exercise by rotating the hips 'round and 'round.

b. Another good hip exercise may be called the "pendulum" exercise. Relax the muscles of the right leg, keeping all the other muscles firmly tensed. Then swing the leg from the hip joint, like a pendulum, backward and forward. Try to do this without support, balanced on the one leg, as it materially assists

FIG. 19

in developing the muscles. Then repeat with the left leg. Next, relax the muscles of the leg from the knee downward, keeping the muscles of the thigh rigid, and swing the leg backward and forward from the knee

only as in Fig. 20 and increase the number of movements each day, as the muscles gain strength and you gain experience.

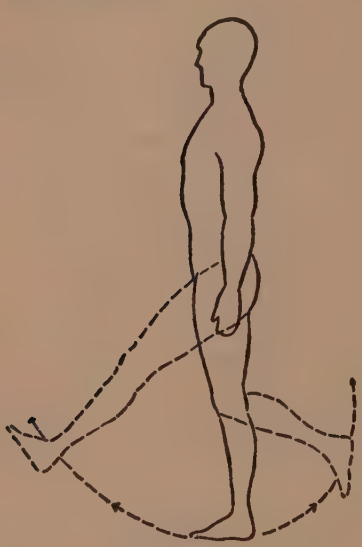

FIG. 20

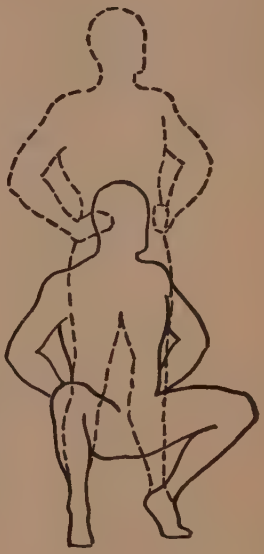

FIG. 21

c. Figures 21 and 22 illustrate some excellent leg exercises which bring into play certain muscles that usually receive but little exercise. Hence you will find them of great benefit in strengthening and therefore in beautifying your limbs. Remember, there is no real physical beauty without health. And remember, too, that many a woman's heart has sunk to its depths when she sees the spindly legs of her hero for the first time, and many a man's interest has vanished when he catches sight of the thin or heavy legs of the

pretty-faced girl he has been flirting with at the next table.

4. *Ankle and Foot Exercises.* One of the most painful afflictions of civilized man is fallen arches. They are due in part to long hours of standing in poorly fitting shoes and in part to lack of muscle tone. Most

FIG. 22

cases of fallen arches can be prevented by regularly exercising the foot and ankle—and, of course, wearing the proper shoes.

One of the simplest and yet one of the most beneficial exercises consists of standing upright, holding

yourself firmly and stiffly and then raising yourself up and down on your toes. (See Fig. 23.)

5. *Whole Body Exercises.* You are probably surprised that we have seemingly described exercises for every part of the body except the all-important abdomen and are now about to give some general exercises without any mention of the abdomen. We want to assure

Fig. 23

you that we are not neglecting this part of your anatomy in which you are rightfully most interested. No specific mention has been made of the abdomen simply because many of the exercises we described, while primarily intended for other parts, exercise the abdomen as well. This is also true of the exercises we

are about to describe—while they exercise the whole body, most of them exercise and therefore strengthen the muscles of the abdomen.

a. The well-known bending exercise is one of them. Raise the arms above the head, alongside the ears, then

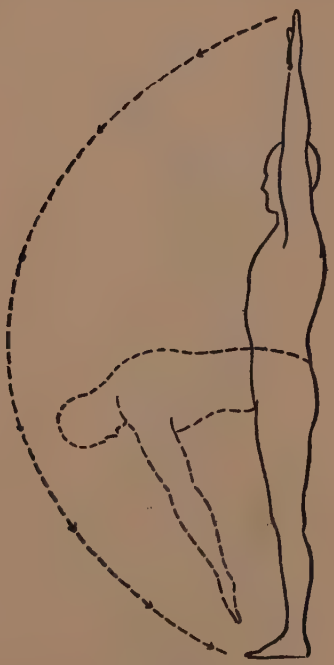

Fig. 24

bring them down with a steady sweep, without bending the knees, until the fingers touch the floor. Be sure to relax the muscles of your neck and allow your head to hang. (See Fig. 24.)

The reverse of this exercise is also beneficial to the abdomen as well as to the back and body in general. Place the hands upon the breast and drop the head backward, a little to one side. Then bend the body backward as far as possible. (See Fig. 25.)

Fig. 25

b. Curve the right arm above the head, toward the left shoulder, and allow the weight of the body to rest on the left leg, the right foot being carried slightly outward. Allow the body to hang down as far as possible on the left side, without straining too much. Then reverse the movement. (See Fig. 26.)

c. Another good strengthener, but somewhat more strenuous, is one quite similar to the bending exercise. Lie flat on your back on the floor, with your arms raised above your head, alongside your ears. Keeping your legs stiff and your arms in the same position, raise your body slowly from the waist, bending at the

Fig. 26

waist until your hands touch your toes. You'll probably not be able to do it more than once or twice at first, but when you have mastered it to the extent of acquiring an easy swing to your movements, you'll find that it not only strengthens your muscles and

melts away superfluous fat from your belly, but that it is very enjoyable and relaxing. (See Fig. 27.)

6. *Stretching.* Stretching is quite a luxury—and a most pleasurable one—but few people know how to do it.

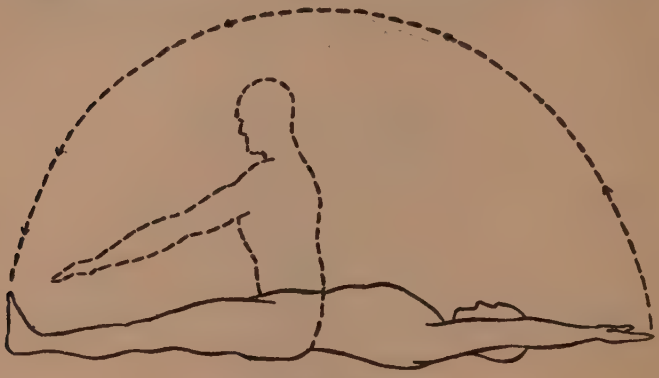

Fig. 27

Stand in the position indicated in Fig. 28. Then raise yourself on the tips of your toes and try your best to touch the ceiling. You'll find this exercise an excellent relaxation.

In the foregoing exercises, as we promised, we have carefully omitted all those requiring apparatus of any kind, selecting only such as can be practiced in the privacy of your own room, without assistance from an instructor or paraphernalia of any kind. Dumbbells, Indian clubs, and other aids are valuable after a certain degree of muscular improvement has been attained, but when that point is reached, we should advise you to join a gymnasium and practice further development under a competent instructor.

All the exercises we have described have been proven of great value in building up the system, and are

designed as aids to the preservation of health and the upbuilding of weakly people—not to develop trained athletes. These exercises bring into play a number of muscles that are not called in general use, and thus develop the whole body. We believe, too, that they

FIG. 28

will bring you pleasure, not only the pleasure of better health, but transitory enjoyment in the mere performing of them—the same kind of enjoyment you get when eating your favorite dish—or indulging in your favorite hobby whether it is collecting stamps or discussing the European situation.

CHAPTER IV

BATHING AND ITS IMPORTANCE TO THE BODY

We all probably judge one another, both consciously and subconsciously, more by the condition of our skin than by anything else. A clear, clean skin is usually indicative of a healthy body and its implications of right-living habits, self-respect, social-mindedness and a keen, alert mind.

Moreover, all of us, whether man or woman or child, are instinctively attracted to beauty. And a clear, clean skin is a beautiful skin—indeed, it is the only kind of skin that is beautiful. No classic features, no silken tresses, no amount of cosmetics, no skillful tailoring can detract from or conceal a poor complexion. On the other hand, a smooth, healthy skin can make a crooked nose, an awkward figure, shabby or out-moded clothes fade into nothingness. But there is no need to dwell upon the charm of fine skin—we all know well the role that physical attractiveness plays in our lives and happiness.

Aside from its social significance, from the standpoint of health the skin is a most important—and in many respects the most important—organ of the body. In the first place, it serves as a protective covering for the whole body and in the second place it performs several important vital functions, not least of which

is the elimination of waste material. Without a clean, healthy skin, there can be no vigor and health, for when the skin is not functioning properly, the other organs are often affected and likewise do not function as they should. Infection may set in—for that matter, a sickly skin is an ideal breeding place for many death-bringing germs and it is a simple matter for them to reach the mouth and nose—the mere touch of the hand on a towel, on food, or the face itself is sufficient.

On the other hand, it is true that if the internal organs are not kept clean and functioning in good order, the skin will be affected. Nevertheless, no matter how well the inside of the body is kept clean, that alone is not sufficient to maintain the skin in a healthy condition. It must be thoroughly cleansed from the outside as often as is necessary. And the first and foremost way to keep the skin clean is through the bath with plenty of water and a good soap.

The Skin and Its Functions

The significance of soap and water and a clean skin for a long life and a healthy one, can only be appreciated if the structure and the functions of the skin are understood. Strangely enough—and it is to be regretted—in spite of the importance of the skin—our knowledge of dermatology is far from complete. Small wonder then, that the average person clings to strange superstitions about this organ and easily falls prey to quacks who spell-bind him—more likely her—into throwing away money on magical liniments and salves guaranteed to cure at least twenty internal disorders over night, not to mention all the rare oils, herbs and

creams which iron out wrinkles, fade out blemishes, remove two-out-of-three chins, dry out blackheads and bring back the beauty of Apollo and Venus before the first jar is emptied (which really would be very bad business). So, forgetting our pet skin tonic or lotion for the moment, let us see what the skin really looks like and how it functions.

First of all, even though your physiology text books emphasize that the liver is the largest solid organ of the human body, the skin really is the largest organ. Indeed, it is about six to eight times larger than the liver and that fact alone should convince the reader of its importance. Moreover, the structure of the skin is as complicated as it is vast. It is divided into three layers—the epidermis, the corium or true skin and subcutaneous tissue. The outer layer or epidermis is composed of a horny layer of dead cells, a layer of translucent epithelial cells, a layer of coarsely granulated cells and a mucous layer which contains the pigment which distinguishes the blond from brunette and protects the underlying layers from the chemical action of the sun's rays. This layer also contains the openings of the sweat and fat glands.

The next layer—the corium—is divided into two parts, the papillary layer which is composed of fine connective tissue fibers and contains nerve endings and loops of blood vessels. With a high-powered magnifying glass you can see tiny, rounded depressions which are the openings of the sweat glands. A single drop of sweat can usually be discerned at each opening, especially after exercise. The lower or reticular layer has a coarser, loose structure than the papillary layer and contains some of the glandular structure of

the skin (fat and sweat glands) as well as hair follicles, muscles and blood vessels.

There is no definite line of demarcation between the reticular layer and the subcutaneous tissue—indeed, many authorities consider the latter a part of the corium. It varies in thickness and is composed of a network of interlacing bundles of connective tissue less clearly arranged than those in the corium and enclosing irregular spaces containing fat cells, so that it serves as a buffer or pad against external violence.

The nutrition of the skin is supplied by arterial blood, the vessels of which are controlled by the vaso-constrictor and vaso-dilator mechanism. In the corium there is a very abundant network of blood vessels, but in the epidermis there are no blood vessels, its nutrition being obtained from the fluid part of the blood which circulated between the layers of the lower part of the epidermis. The outermost layer of the epidermis, which consists of structureless, horny scales, has passed beyond the stage where it needs or can assimilate nutrition.

The vaso-constrictor and vaso-dilator nervous mechanism which controls the blood supply is very sensitive and is affected by many factors, but it is not under voluntary control. It may be affected by direct action on the nerve centers or on the peripheral mechanism of substances in the blood; by reflex stimulation after the application of heat or cold to the surface of the skin; and by various forms of cerebral or mental stimulation such as emotional excitement. Pallor, for instance, may be caused by shock—the blood vessels of the skin contract and the blood supply of this area is diminished. Blushing is another example of the

disturbance of the blood supply produced by emotional factors. In this instance the blood vessels are dilated and the blood rushes to the surface. Poisonous substances in the blood may produce similar disturbances. The most familiar example of this is the flushing of the face from alcohol or from improper eating. The control of the blood supply by the nerves exists throughout the skin, but it is more sensitive in the skin of the face, as most of us have learned through experience, often to our embarrassment. When you're trying to act nonchalant when the girl of your dreams puts a flower in your lapel, you feel like choking little brother who points his finger at you and shrills out that "he's blushing, he's blushing!"

The functions of the skin may be divided into five general classes: protective, sensory, respiratory, heat-regulatory and secretory. As a protective covering, it guards against the harmful action of the sun's rays, the loss of body fluids, the entrance of toxic substances into the body, and against mechanical violence. The outer surface of the epidermis is highly resistant and very dense and insensitive. Therefore, although it is tissue-thin, it serves perfectly to protect the living, highly sensitive layers lying beneath it, against all ordinary injury. It is remarkably resistant not only to physical contacts, but also to the most active chemical ones and is able to prevent the invasion of bacteria. The corium is an exceedingly tough tissue, and is therefore the layer that gives the skin its strength. The fatty layer which lies beneath the corium is a very loose network and therefore acts as the cushion or buffer against any physical violence. It also gives a smooth even contour to the body—curves instead

of knobs and angles. And as it is composed of a very loose network of fibers with spaces filled with roundish deposits of fat, it furnishes the skin with a comparatively large amount of freedom of movement over the underlying structures.

In connection with its protective function, the sensory function of the skin is very important. The skin is richly supplied with nerves, as we have said, and it is highly sensitive to heat, cold, pain, pressure and friction. This sensitiveness not only serves as a warning against harmful external forces, but it also controls the other functions, as well as the nutrition of the skin. As we shall see, this sensitiveness of the skin is of utmost importance in the effect that baths of varied temperatures have on the system.

As we explained before, the source of heat and energy in the body is the constant oxidation of tissue. While oxidation is taking place all the time, the rate of oxidation varies with the output of energy. During sleep, for example, the burning of tissue is much slower than during exercise. It is obvious that a delicate heat-regulating mechanism is required to keep the body at even temperature. This mechanism is chiefly provided for by the skin. The surface of the body, it will be recalled, has just beneath it a very abundant network of blood vessels. The constant flow of blood through the vessels causes continuous radiation of heat from the surface. When the surface is cold and the body needs to retain heat, minute muscles in the skin contract and cause "goose flesh". By this mechanism the blood vessels are emptied, perspiration is checked and the amount of heat given off is much less. On the other hand, in the presence of ex-

cessive heat, or when heat is produced during muscular exercise, the cutaneous blood vessels dilate, the skin becomes congested with blood and at the same time the perspiration becomes "sensible". This increased supply of blood rapidly gives off heat by radiation and the body is further cooled by the evaporation of sweat.

The skin is also important as an organ of elimination and excretes the waste products of the body just as the lungs and kidneys do. The waste products are given off through the pores of the skin in the form of sweat. It is estimated that about one liter of water is given off during twenty-four hours, and during exercise, two or three as much.

The secretion of sweat is constant unless stimulated to an increased degree through exercise, emotion, drugs or illness. It evaporates as rapidly as it is formed and is known as "insensible perspiration". When it is given off in abnormal amounts it is called "sensible perspiration".

Sweat is about 99 per cent water and through its secretion the chief function of perspiration is performed—the elimination of water. This regulates the temperature of the body and, as we pointed out above, renders the horny layer of the epidermis soft and pliable by percolating through the spaces between the cells and thereby keeping them moist.

The sebaceous or fat glands are also constantly secreting a semi-fluid substance called sebum. This also tends to keep the skin soft and pliable as well as to protect it from external injury. As sebum tends to harden in the ducts and form blackheads which may cause infection, the necessity of keeping the pores clean and open is imperative. This is particularly true

in adolescence when the glands are secreting more than at any other period in life.

Before leaving the subject of the functions of the skin, a few words—particularly for the female sex's benefit—should be said on the subject of the skin as an absorptive agent. The skin is primarily an organ of *elimination* and of protection against foreign substances. In no sense is it an active organ of absorption, although some substances, such as certain vitamins and fats, may be absorbed and utilized in some measure when properly applied. There is practically no absorption of fats when merely placed on the skin. Fats and oils, however, may be absorbed by inunction or friction. And if the natural fat of the skin is removed by either or if the blood vessels of the skin are dilated by the application of heat, absorption takes place more readily.

This fact is of utmost importance when considering the effect of the various preparations used in the care of the skin—soaps, lotions, medicaments, as well as external applications for internal cures, such as counterirritants, for two reasons. First, abrasive substances may break down the physical structure of the skin and therefore lower its resisting powers. Likewise, strong chemicals, such as caustics, may break down the chemical composition of the skin and lower its resistance.

The horny layer of the skin is markedly acid and as such has the power to inhibit the growth of or to destroy many germs. On the other hand, the lower layers are alkaline. It is in this alkaline medium that many germs multiply. Hence the necessity of keeping the acid layer clean, intact and free from excess

perspiration which lowers the resistance of the outer layer and acts as food for bacteria and other micro-organisms.

The horny substance of the outer layer of the skin not only protects the skin from mechanical irritation, but it can stand prolonged macerations in 50 per cent solutions of mineral acids. On the other hand, it is soluble in cold, weak solutions of potash and soda, quick lime, alkaline earths and sulphides. These substances can dissolve the horny material that holds the hair roots in place and act as depilatories.

We could go on describing the prophylactic powers that the skin possesses in addition to its protective powers against mechanical and chemical injury, if time and space permitted. But we shall have to close the subject with a warning that it should be kept in mind that the resistance of the skin is only relative, nor is it the same all over. It is slower and slighter on the external surfaces than on the flexor surfaces, the differences not being governed by the thickness of the skin. It is such inequalities as these that make the skin less resistant to external noxae. And, with particular reference to the effect of soap on the skin, it should be kept in mind that *alkalies* are the chemical agents against which the outer layers of the skin have the least power of defense.

Before entering the all-important subject of how to keep the skin in good condition, let us quickly sum up what we have found, for truly our findings have been many and complicated. The skin, we learned, is one of the most important organs of the body, from a social and from a physiological point of view. It is composed of three layers of a highly complicated

physical and chemical structure. Each layer has its own particular functions to perform. The outer layer is composed of a horny substance which serves as a protective covering against mechanical and chemical injury, not only to the skin itself, but to organism as a whole. This layer also has self-disinfecting powers which are particularly efficacious when the skin is clean and especially when it is free from fatty substances. Moreover perspiration is known to be an excellent culture medium for bacteria and fungi. It is obvious, therefore, that the skin must be kept clean and intact if it is to perform its functions of protection, elimination, heat regulation, respiration and sensation. And we shall soon see that the best way to keep the skin clean and intact is through the soap and water bath—provided the soap is mild, nonirritating and yet thoroughly detergent.

Diseases of the Skin

We sincerely believe that enough has been said to convince the reader that the skin deserves as much care as any other organ and we hope that those of you who have been guilty of neglecting it, will henceforth treat it with all the respect it deserves. However, for you who are known as skeptics, we have another proof of the importance of this organ, in the form of the dread diseases that may attack it—and through it the whole body. And, strangely enough, some of them may be caused by as innocent an looking object as a cake of soap.

It is not for us, of course, to describe the gruesome diseases in detail. Just stop a moment and recall the pictures you've seen when furtively glancing through

a textbook on dermatology, or recall the face of a friend (or your own) who was suffering from a severe case of allergy or eczema. That will be sufficient. Here we need only point out the various ways in which a skin may be affected. Two well-known authorities sum up the causal factors in skin diseases under fourteen broad headings. Individual sensitivity or allergy heads the list. More and more the medical profession is realizing that allergy is the root, not only of much skin trouble, but of serious systemic disturbances. For this reason we have devoted an entire chapter to the subject. It will not be necessary to discuss the subject again here.

Race and nationality are also important factors in skin diseases. For instance, psoriasis is common amongst the Irish, pellagra amongst the Latins, such as the Italians, and various diseases of nervous origin among the Hebrews. Age, too, affects the skin. Advertisements, if nothing else, have impressed upon the public that acne is a condition usually associated with adolescence, being due to an oversecretion of the sebaceous glands of the skin. Likewise a form of pruritis or itching is associated with old age and still other conditions with infancy and childhood. Still other conditions are limited to one or the other sex.

Doubtlessly you have experienced some of the annoying and embarrassing rashes that break out on your skin when the seasons change or you move from one climate to another. Psoriasis and eczema, for example are worse in winter than in summer and prickly heat is worse in hot weather.

Occupation is another cause and a very important cause, of skin trouble. Dish washers, laundry workers,

housemaids, bakers, etc., are all subject to dermatitis due to the materials they constantly handle, such as soap and other cleaning materials, bleaches, flour, sugar—in short, anything with which the skin may come in constant contact. The reaction may be chemical or allergic.

A faulty diet may cause serious and persistent skin trouble, such as pellagra and scurvy. These types of dermatitis are considered fully in the chapter on vitamins. Various foods, too, may produce hives, redness and swelling, as we shall see when we come to the study of allergies. Drugs taken internally frequently cause eruptions on the skin. Bromide and luminol rashes are quite common. Moreover, drugs merely applied to the skin may be highly injurious—sulphur, cresol, carbolic acid, etc. This, too, is often an allergic condition.

Internal secretion disturbances may produce abnormal skin conditions, and circulatory disturbances may produce varicose veins, eczema or ulcers.

Boils are caused by bacteria and ringworm and similar diseases are caused by fungi. In this connection it should be remembered that dermatitis caused by any of the other factors opens the way for invasion by bacteria.

Prolonged exposure to the sun's rays produce sun burn, freckles and more serious inflammatory conditions which sometimes involve the whole organism. Blonds are more likely to be subject to such disturbances than brunettes. It should be pointed out here that the color of the hair and eyes has nothing to do with the scientific classification of blond and brunette. One may have black hair and still have a blond skin

with its sensitiveness to the sun's rays and a tendency to dryness.

The form of skin irritation which is probably of greatest interest to us at the present moment, since soap is one of its major causes, is known as "contact dermatitis". It is also known as trade or occupational dermatitis or eczema. Its manifestations are familiar to all of us. They vary from a mild itching and scaling and redness to actual pain, swelling, inflammation, even cracks, lesions, vesicles and ulcers which are not only unsightly and pain-giving, but which pave the way for bacterial invasion and disturbances of a serious constitutional order. And it must be remembered that the vast majority of skin troubles are usually mild in the outset and that this mild condition is nothing but a warning of impending disaster if steps are not taken at once to remedy it.

While all contact dermatitis, as the name implies, is due to the contact of the skin with a given substance or a combination of substances, the reaction may be one of several. It may be purely physical. That is, it may be due to some abrasive substance, such as pumice in soap, which may scrape and tear away the outer covering of the skin, exposing the more delicate inner layers to the invasion of bacteria or harsh chemicals. Or it may be due to weather conditions, as chapping in winter. Again, the reaction may be chemical or physico-chemical. For example, carbolic acid and cresol (which are often found in so-called deodorant soaps) may actually burn the skin. And sometimes, as we mentioned above, the reaction may be allergic. Orris root, to take a common allergen,

which is found in many cosmetics and soaps, causes an allergic reaction in a large number of persons.

More will be said of contact dermatitis and allergy anon. Here it is only necessary to emphasize that one form of irritation opens the door for other forms—and forms of a more serious nature. For instance, if a person is suffering from an allergic condition due to contact with a perfume such as bergamot, which causes many cases of allergy, the resistance of the skin is lowered and the way is paved for various other diseases. Nor is this fact only true of those forms of irritation which may be definitely classed as occupational dermatitis. Doubtlessly you have suffered from the painful annoyance of ordinary chapping in cold winter weather. The chapping is due, in this instance, to the unnatural dryness of the skin caused by the cold. Chapping may also be caused by too frequent washing, especially with strong soaps, or by the failure to dry the parts thoroughly. Naturally, a chapped skin has not the resistance that a healthy, well-oiled skin has, and is therefore subject to external irritants, and more liable to infection.

Chapping, whether due to cold weather or to harsh soaps, is not the only cause of lowered skin resistance. The coming on of occupational rash is hastened weeks by hyperidrosis or excessive perspiring, and months by seborrhea or excessive fat secretion. High temperatures or strenuous exercise causes the body to sweat freely. The sweat, which is normally acid in reaction, becomes markedly alkaline in reaction and dissolves out and washes away the natural fats of the skin. Under these conditions even bland dusts may become irritants. Recall, too, that sweat is favorable

for the growth of bacteria, some molds and wild yeast. Moreover, working in a moist or dry heat, especially if added to strenuous exertion, produces congestion and abnormal activity of the skin glands. Prickly heat is the result.

Why the Skin Must Be Kept Clean

It should be obvious by this time that a clean skin is all important. Since the skin has been provided for by nature to act as a protective covering of the body as well as an organ of elimination, it is essential for its complete and perfect functioning that the integrity of its surface remain unbroken. It can only be maintained if the surface resistance is not lowered by disease, wounds or chemicals. It is evident that the first rule to observe is cleanliness. Cleanliness is the safeguard against the ills caused by excess sweat and excess fat secretion; it is a safeguard against clogged pores and all the conditions they produce; it is a safeguard against the irritation of foreign substances, whether their action be purely chemical or allergic; and consequently it is a protection against the invasion of bacteria and other disease-causing organisms.

We have learned, moreover, that the skin possesses self-disinfecting powers. This important function cannot be over emphasized, nor the state of cleanliness necessary for its performance. As one well-known authority points out, dirty or fat-covered skin may have viable bacteria on it very many hours, for the dirt or fat as a breeding place for germs is far more potent than the disinfecting power of the skin.

It must be remembered that when a skin fails to

perform its functions properly and grows sick because it has not been kept clean, that the entire body and its performance is affected—and this is due not only to the invasion of bacteria through the skin or the organs of respiration. When the skin fails to perform its functions of heat regulation and elimination of waste adequately, the other organs are over-worked to keep the body in normal condition. This overtaxing may lower both mental and physical efficiency.

Undoubtedly you remember the epidemic of amœbic dysentery which broke out in Chicago during the Exposition, and from there was taken to the home cities of the sightseers. Whatever might have been the ultimate source of this disease, it was definitely proved that it was spread through unclean hands, in a large hotel, which washed and dried the dishes and handled the food. It is difficult to believe that havoc could be wrought by a pair of unclean hands, but such is the case. And similar cases of infection are being constantly spread. Pneumonia, influenza and colds are frequently contracted in this manner. A person suffering from a cold may dry the supper dishes. He or she might suddenly sneeze, spreading the filtrable virus that causes the cold, over the towel with which he wipes the dishes. Naturally the germs reach the dish and from there the food which enters the mouth. In a short time another cold results. So you see how necessary clean hands are—it is through the medium of hands that respiratory and other diseases may be easily contracted.

But a clean skin is not only necessary for health—it is equally necessary for beauty. To many persons, particularly women, beauty of skin is just as neces-

sary as health. A lovely skin is one that is clear and soft and smooth. It is unmarred by unsightly blemishes such as roughness, scales, swollenness, blackheads, oiliness, pimples and eruptions. While the general care of the body is essential for such a skin, local care is equally important. No skin can be beautiful if it is not regularly and properly cleansed with materials that are actively detergent and yet non-irritating. This is particularly true of the hands and face which are constantly exposed to dust and grime and bacteria, as well as to contact with irritating chemicals used in one's occupation, as in the case of a woman who does housework or man who works in a dye factory.

Care of the Skin

The hygiene of the skin embraces all the factors that are essential for the maintenance of general good health. Sleep, exercise, fresh air, sunshine, proper elimination of waste, balanced diet, protective, but non-restricting clothing and bathing are all necessary. At present we are concerned with the local care and cleansing of the skin.

All dermatologists and most honest beauty specialists agree that the best way to cleanse the skin is through the regular use of good soap and water, the temperature of the water varying with the type of water, the type of soap and the amount and type of dirt that has accumulated on the skin. Soft water cleanses more easily than hard, and therefore can be used at a cooler temperature. Some soaps lather only in soft water, while others lather in both. Again, some soaps require water of a rather high temperature

before they lather, while others lather equally well in cooler temperatures.

The manner of washing, i.e., the use of tub, shower, cloth, brush or fingers, and the number of times one washes, is an individual matter and depends largely on the nature of one's skin and one's environment. A tender skin cannot be bathed as frequently as a hardy one (although, to be sure, such a skin may be conditioned to more frequent ablutions), an oily skin and one that tends to perspire excessively must be cleansed more frequently than a dry one, and a skin exposed to the dust and grime of the city requires frequent washing. The only rules that can be generally applied are: wash as frequently as necessary, wash until the skin is thoroughly cleansed, use only that soap which "agrees" with one's skin and rinse and dry thoroughly.

It is logical to assume, however, that the best time for a complete cleansing bath is at night, just before retiring. Ordinarily the water should be quite warm for the cleansing operation and should be followed by a cool shower or immersion. Most persons find that a warm bath at night is not exciting—in fact, is rather soothing and relaxing. Some, on the other hand, find that they cannot sleep, that such a bath is stimulating. Such individuals, of course, had better confine their full bath to the day time, preferably the morning on arising. But whichever time you find best suited to your constitution and habits, remember that the face and hands should always be cleansed thoroughly before retiring, and if possible at least two or three times during the day. Even a tender skin can stand

that, providing it is dried thoroughly and water near the body temperature is used.

Speaking of full baths, do you know how to draw a tub of water? The question probably seems absurd at first glance, but we are almost willing to wager that your answer (and those of most of your friends if you ask them) is equally absurd. And we are also willing to wager that we know just how you draw a tub (and this method applies likewise to those of you who prefer the shower). You turn on the spigots full force until the tub is filled and then you step into it gingerly or nonchalantly, depending on your courage and toughness of skin. Ouch! it's hot. This time the cold water is turned on full blast until the water reaches the right temperature. And no doubt you had to let out some of the hot water. By the time you step into the tub, the bathroom is filled with a nice wet steam that somewhat resembles a London fog. And when you emerge you find the walls actually weeping and the mirrors are no longer to be seen. What's worse, no matter how much you rub, you can't get dried. As a result you're in a good condition to "catch cold".

Fortunately there is a right way to fill a tub (or regulate a shower). Run the tub almost one third or one half full of cold water, turn off the cold water, and then run in the hot, until the right temperature is reached. You'll be surprised to find that your heating bill is considerably less, that the room won't be filled with steam and that when you leave the bathroom you will feel pleasantly dry. And, best of all, the next occupant (particularly if she is a modern woman who indulges in permanents and "make-up"), will bless you, and she will doubly bless you if she is a good

housewife who takes pride in shiny walls devoid of water marks and mirrors that really reflect.

Even if you are accustomed to take your cleansing bath at night, you probably enjoy a quick bath in the morning—it is an eye-opener and makes you look so fresh. Hardy souls like a brisk cold shower and are apt to look down upon those of us who prefer a warm one, probably finished off with a short cool immersion or shower. If you feel chilly after a cold shower, have a queer sensation in your head, or have any other sensation save one of exhilaration, don't try to emulate the cold water addicts and don't feel that you are a softy—you'll probably live just as long or longer than the cold water men. You might ask them, the next time they tweek you, how they feel after a warm or hot shower in the morning. But if some puritanical streak in you makes you feel that you should brave the cold shower, consult your physician and get his verdict first. It is well to remember, too, that it is wise to wrap a wet towel around your head or sprinkle your body with cold water before immersing yourself in cold water. In this way you will avoid any shock to your system or pressure headache. It is also wise not to take a full bath directly after eating, or to go out in the cold after a warm bath.

It might surprise you to know that the first bath tub with running water was built less than a hundred years ago. A Mr. Alan Thompson of Cincinnati, Ohio, installed one made of mahogany and lead in his home December 20, 1842. He gave a Christmas party to introduce it to society and some of the bolder guests actually bathed in it. It received widespread publicity through the newspapers and contro-

versies waxed hot and furious throughout the whole country. The consensus of opinion was that it was unsanitary. The next year Philadelphia enacted laws prohibiting its installation and in Virginia one was compelled to pay a tax of thirty dollars a year if he wanted to have such a doubtful luxury in his home.

President Fillmore was the first president to use a bathtub. After trying the celebrated Cincinnati tub, he had one installed in the White House in 1850. Yet we must not forget that a tub quite similar to our own was recently excavated by archeologists in what was of old called Olynthus, and that many ultra-modern establishments have adopted its style.

We have from time to time mentioned soap as the best cleansing agent for the skin. There are, of course, many women (and a few men) who are deluded in the belief that their skin is too delicate for soap and that they can only use cold creams. In reality such skins are rare indeed, and the few that cannot endure soap are usually under a dermatologist's care for some abnormal condition or disease. The humorous part of it is, toilet soap is made of the identical ingredients that creams are. Indeed, many soaps openly claim to be made with cold cream or lanolin, and all of them are more actively detergent than creams. For that matter, it might interest those with "delicate skins" to know that soap was originally used as a medicament—and that its basic formula was not much different from that used today.

Soap

Toilet soaps may be divided roughly into about eight classes. Milled soaps are prepared by first obtaining a

finely powdered or flaked soap that is pure and dry, then adding perfume, if desired, and compressing the soap into cakes. More delicate perfumes can be used for this class of soaps, since the perfume is mixed in the process of milling, than in ordinary soaps where the perfume is added before the soap is dried. Milled soaps are economical as they contain little water. They are of good appearance and may be used without deteriorating or changing shape.

Floating soaps are soaps in which tiny air bubbles are incorporated into the hot soap by a specially constructed crutcher. These air bubbles are so small that they are almost invisible and so numerous that they not only make the soap lighter in water, but also largely increase the surface of the soap exposed to the water when used and therefore render it more quickly soluble than soap without bubbles.

Castile was one of the first, if not the first, toilet soap to be manufactured on a large scale. It was originally made from pure olive oil and caustic soda without the admixture of any other fat. Many of the so-called Castile soaps, especially those having distinctive names, are plain coconut oil soaps and are not good toilet soaps. No other soap is so much imitated as Castile. In the United States in particular one must be wary of Castile soaps for now the term Castile refers to a *type* of soap.

Transparent soaps were originally made by dissolving soap in alcohol, filtering and evaporating off most of the alcohol. Now the transparent is generally due to the presence of alcohol, glycerol or sugar. The transparency was formerly considered an indication

of freedom from impurities, but is actually no indication whatever of quality or purity.

Various drugs are often combined with a soap with the purpose of making it prophylactic, antiseptic, bactericidal or curative. Theoretically soaps should be more useful than they are, but in practice they do not prove as satisfactory as they promise in theory. They do not carry the drug as well as ointments do and the dosage is uncertain in amount and concentration. Aside from the fact that such drugs may prove irritating to the skin, it is not likely that the soap itself is improved insofar as its cleaning power is concerned. Usually it is lessened.

A superfatted soap is one which contains an excess amount of fatty substance. The fat is usually olive oil or lanolin, the latter being superior since it does not become rancid. Such a soap, providing the excess of fat does not exceed 4 per cent olive oil or 1 per cent lanolin, is particularly good for sensitive skins which cannot endure excess free alkali.

There are many other forms of toilet soap such as tar soap, liquid and green soaps, special hand grit soaps, etc., but since they are not in general use there is no need to dwell on them here.

The effect of soap on the skin may be divided into beneficial effects and injurious effects. In the first division are included the detergent action, the germicidal or antiseptic action and the emollient action of the soap. The injurious effects may manifest themselves as physical or chemical irritation or allergy. We have already described the various types of dermatitis that are caused by foreign substances that come in contact with the skin, and elsewhere allergy will be discussed

more fully, so that it is not necessary to describe the manifestations of soap irritation—they are the same.

Any of the ingredients which go into the making of a soap may cause irritation. Certain fats and oils, for example, are highly irritating, coconut and cottonseed oil being the worse offenders and tallow, lanolin and castor oil being the mildest. Free alkali in excess amounts is also irritating. Many perfumes, dyes, rosin, orris root, soap bark, silicate of sodium and the medicaments of so-called germicidal soaps may be offenders of the first rank, both from an allergic and chemical standpoint. Therefore, the greatest care must be exercised in the selection of a soap.

It must be remembered, too, that since soap is generally used in conjunction with water, the action of the soap depends to a certain extent on the concentration of the solution, the temperature and quality of the water. Water itself may act as an irritant since even when used alone it removes the normal oils of the skin.

While no theory has been definitely established as to the action of soap, it is known that a soap solution, due to its power of lowering surface tension, with the aid of mechanical action, detaches and breaks up loosened particles of dirt and surrounds them with a soapy film which prevents the particles from adhering to the surface being cleansed. The particles are held suspended or emulsified in the water and soap solution. Both the soap and dirt are removed by thorough rinsing.

This is precisely what happens when soap is used to cleanse the skin. Being a solvent for fats, soap emulsifies and removes the excess fatty secretion from

the sebaceous glands which has combined with dirt particles, bits of dead skin and perspiration. Not only does such a layer of dirt make a fine culture medium for bacteria, but it clogs the openings of the sweat glands and sebaceous glands. As a result these glands cannot perform their function of lubrication properly. The skin becomes hard and scaly and tiny bumps appear. Unsightly blackheads stop up the opening of the glands and are often the beginning of infectious pimples. A mild, pure soap that cleanses thoroughly keeps the skin soft and pliable, partly by the emollient action of the oils and fats used in the making of the soap, and partly by the removal of the dirt, the hardened cuticle, excess perspiration and sebum. On the other hand, a soap that is too active or too harsh in its action may dissolve out the natural fat of the skin and leave it dry and thin.

In addition to its softening and cleansing action, soap has a definite antiseptic action. Until about 1880 soap was considered as a merely general hygienic agent. About that time the idea was conceived to incorporate various medicaments in soap to increase or impart curative or bactericidal properties. This naturally led to innumerable experiments to test the relative efficiency of the various types of medicated soaps and particularly their superiority to ordinary soaps. Such experiments have now definitely proved that the so-called germicidal soaps are by no means superior to ordinary toilet soaps in this respect. Indeed, as we explained above, they are generally inferior to the ordinary soaps in their cleansing action, and if it were possible to incorporate a sufficient quantity of the germicidal drug and to use the soap in a

concentration and for a length of time sufficient to be effective, it would be highly irritating to the skin.

On the other hand, experiments have proved that ordinary toilet soaps are antiseptic and germicidal in their action. This property is partly due to the detergent action of the soap—the washing away of the germs—and partly due to its chemical action. The action, however, is selective. Soap will kill some frail microorganisms, but it cannot be relied upon, for instance, to kill staphylococci or typhoid bacilli. But if the skin is washed thoroughly with a good lather of any ordinary toilet soap, it will do away with many adhering diphtheria bacilli, streptococci and pneumococci.

We have now completed the story of the skin—its delicacy and sensitiveness, the numerous and complicated functions it performs and the structural components of the organ that make it possible to perform these functions, and lastly, the effect that the condition of the skin has on the whole body and the absolute necessity of the utmost thoughtful care in order to maintain the health of the skin and the whole body. For the normal skin soap and water are the best guardians of health. But there are soaps and soaps on the market and almost as many claims of miracle performances as there are soaps. And not all soaps are good, any more than all claims are justified. How then, you ask, does one go about selecting a good soap? It's really quite a simple matter.

Every soap should be selected primarily on the basis of its ability to meet the special cleaning requirements of the moment, and its effect on the substance to be cleaned, whether it be the skin, cloth, wood,

metal or other substance. As almost all soap comes in contact with the skin, directly or indirectly, its effect on the skin is of foremost importance. Hence all soap, and toilet soap in particular, should be selected for its cleansing power and its non-irritating effect. The water content, the amount of free alkali or acid, the amount and kind of builders or fillers, the salt content, the quality of oils or fats used, the perfume and coloring matter and the relation of the weight of soaps to its price are all important. Experience will soon tell whether a soap is actively cleansing and whether it is non-irritating. And with respect to the latter qualifications, remember that one soap may be soothing to one type of skin, but irritating to another.

Generally speaking, avoid all highly colored and highly perfumed soaps and those containing medications which purport to make the soap a deodorant, a germicide or cure-all. Don't buy imported soaps—you cannot be sure what they contain; they are apt to be rancid and always are more expensive than is warranted. Only soap manufactured by a reliable company with a reputation to be maintained should be purchased, and its directions should be followed exactly. When you find a soap that thoroughly cleanses your particular skin and leaves it smooth and clear, and when you know that the uniformity and the purity of that soap are assured by the manufacturer's name, use that soap, and that soap alone.

Most persons will find that Dr. Charles A. Tyrrell's Skin Soap meets all the requirements. It forms a rich, creamy, lasting lather that is actively cleansing, in both soft and hard water and in cold as well as warm water. It contains no irritating perfume or coloring

matter, and the addition of cold cream and lanolin is an assurance against drying, chapping or any other form of irritation. In fact, it is so gentle in its action that many men have found it delightful to shave with. Moreover, it does not become rancid, crack or lose its shape or deteriorate in any other manner. It is economical, too, for a single cake lasts a long time and can be used down to its last bubble. But try a cake and see for yourself how clear and smooth and glowingly healthy your skin looks and how soft and satiny it feels.

CHAPTER V

THE WATER-WAY TO BALANCED HEALTH

None of us bathe merely for external cleanliness and the benefits derived therefrom. If that were true, junior would not have to be reprimanded for swimming in the old pond long before the trees are green, and Atlantic City and Palm Beach would be unknown. Bathing, like eating, can be a pure sensuous delight. The contact of the skin with water, whether in a tub, under a shower, in a pool, a river or the ocean is an almost unparalleled pleasure. But the pleasure is not due only to the touch of the water on the skin, but to the far-reaching effects it has on the internal system—effects which vary with the temperature of the water, the mode of application and the length of contact with the water. It is these effects that have made water one of the principal therapeutic remedies known to man.

The use of water goes back far beyond the historic period and is lost in the folklore and legends of primitive mankind. Primitive man soon learned to dip injured limbs into cooling streams. He worshipped the waters that gave life and health, and to bathe in waters of the Ganges, the Nile and other waters, became a religious ritual. Even the Greeks combined religion with bathing, as witness the natural springs

dedicated to the god Heracles and the warm baths of the Cilician nymphs. Nor must we forget that Achilles was bathed in the waters of the Styx to give him immortality. And the ceaseless search for the fountain of youth is one of the instinctive quests which form the background of modern water therapy of hydrotherapy.

Despite the ceremonial cleansings, however, the ancients never forgot the healing qualities of water. Hippocrates, the father of physiotherapy, discarded many of the drugs that were handed down from the Egyptians and treated his patients with proper diet, fresh air, change of climate, purgation, massage and hydrotherapy. And the sumptuous baths of the Romans, which we described before, are an additional witness of this fact.

The Romans passed their knowledge of the beneficial effects of bathing to the Arabians who took it to Spain and to Northern Africa. And during the Middle Ages the science of water therapy received its chief impetus from the Arabian physicians who advocated baths for fevers. We are apt to think that the folk who lived in the Middle Ages were an unclean, unscientific lot. In truth, this is an exaggeration. Not only did the physicians prescribe baths, but there were bathkeepers who enrolled themselves in guilds and erected bath houses all over Europe. And the knowledge of the beneficial effects of water was passed on and enlarged upon in the Renaissance and modern times.

Oddly enough, truly scientific therapy of modern times was inaugurated in 1830 by a crude and powerful Silesian peasant with no medical training, one

Vincenz Priessnitz. He sprained his wrist and crushed his thumb one day and healed it by immersion in cold water. Some time later a cart passed over our hero's body and broke his ribs. When he heard the gloomy remarks of his physicians, he tore his bandages off and applied cold, wet compresses to his ribs and pressed his abdomen against his window sill, breathing deeply. So salutory was his treatment that he established a hydropathic institute at Graefenberg. Almost at once proceedings were started against him since he was not a doctor, but the Austrian government intervened and before long physicians from all countries flocked to him to learn the procedure of douche, plunge, dripping sheet, dry heat pack, wet sheet pack, foot bath, sitz bath, warm and tepid bath.

Shortly afterwards, in Germany, a series of experimental researches were undertaken with the object of ascertaining more exactly the effect of bathing at varied temperatures, its influence on the circulatory system and the nervous systems and on metabolism in general. Subsequently, a large number of clinical and experimental studies along the same lines were conducted by workers in different countries.

It is to be regretted that hydrotherapy in the United States has been too frequently controlled by faddists. For this reason prejudice sometimes exists against water treatment. However, the subject found a scientific advocate in Dr. Simon Baruch, who had a chair at Columbia University where he taught five hundred students that water has a place in the Materia Medica as a stimulant, sedative, tonic, diuretic, diaphoretic, emetic, purgative, promoter of metabo-

lism, antipyretic, hypnotic, antiseptic and even local anaesthetic.

The World War taught us the value of hydrotherapy more than any other factor of recent date. Not only was it used extensively during the War, but in both this country and in Europe hydrotherapy has been well established in veteran hospitals and in hospitals for the mentally unstable. Indeed, hydrotherapy is now considered indispensable—although, to be sure, no system of medicine can be entirely built on water. There is still much to be learned in the field of hydrotherapeutics, especially since we have so many new scientific weapons on hand. It is safe to predict, however, that its beneficial effects will be more and more recognized both in the hospital and in the home as research progresses.

Broadly speaking, hydrotherapy is used to modify the condition of the body by utilizing ordinary water on the skin as a vehicle of heat or cold or force. Its peculiar physical characteristics make it an ideal instrument for bringing about such modification. In the first place, it is a perfect vehicle of heat and cold. In the second place, its application can be localized or spread over the entire body, and with varying degrees of force. And thirdly, according to its temperature it ranges from a solid, through a liquid, to a vapor —all of which states have a marked therapeutic importance.

The effects of the application of water on the skin are both chemical and physical. As a chemical, water is a detergent or cleansing agent, as we have already learned. From a physical standpoint the effects of water are twofold—local, that is, confined to the skin;

and internal, through the media of the nervous and circulatory systems. According to its temperature and force, water may be a tonic, a stimulant or a sedative. Its thermal effect is by far more important than its mechanical effect of force. Generally speaking, water of a temperature cooler or hotter than skin temperature is stimulating, the colder to a greater degree. The neutral bath, on the other hand, that is, a bath which approximates the skin temperature, has a soothing sedative effect.

It is obvious, since any change wrought in an organism by the external application of water is effected through the skin, nervous system and blood vessels, that the mechanism of these three organs is of great importance and that the effect of the various types of baths cannot be fully appreciated without some knowledge of the structure of the skin, particularly in relation to the nervous and circulatory systems. In our review of the hygiene of the skin, we described the structure of the skin as well as its several functions, so that there is no need to repeat here, except to point out that the sensory function of the skin is of special importance. The skin is richly supplied with nerves, it will be recalled, and since it is sensitive it not only serves as a warning against harmful external forces, but controls other functions. This sensitiveness is therefore of utmost importance in the effect of varied temperature baths on the organism.

Moreover, from the previous description of the skin and its functions, one might reasonably surmise, particularly from the heat-regulating and excretory functions, that the temperature of the skin varies. This is indeed the case—while the internal temperature

remains about the same in a normal healthy individual, the temperature of the skin is modified by the weather condition, exercise, amount of perspiration, clothing and many other factors. It varies, too, in different parts of the body of the same individual. Since the skin is the organ with which water comes in direct contact in hydrotherapy, the skin temperature plays an important role in this type of treatment. Indeed, the neutral bath is maintained as near the skin temperature as possible and even in the application of hot and cold baths of all types, it is always taken into consideration, sometimes a preliminary wetting of the skin being given to avoid shock to the nervous system. It is not necessary for us to describe in detail the variations in skin temperature. Suffice to say that generally the skin temperature is a few degrees less than body temperature and that it has a tendency to rise after exercise, eating and in warmer atmospheres. The best way to judge is by the feel of the water on the skin.

As we have said, the blood supply of the skin is derived from branches of a subcutaneous, arterial network which is distributed to the sweat glands, hair follicles and fat. Other branches unite in a network which lies immediately under the sub-papillary network and which gives off arterioles or small arteries and capillaries to the papillae. From the capillaries, the blood supply passes into a sub-capillary network of veins and from thence to the connecting and main skin veins. The blood vessels of the skin are capable of contracting and dilating independently of the heart and this can be brought about by appropriate stimulation. Moreover, as we also explained,

the blood vessels are in close relation to the nerve endings and are therefore affected by their stimulation. Now much of the effect of hydrotherapeutic measures is due to the stimulus of temperature and of the pressure or force of water on these skin nerve endings.

Cold water and warm water in contact with the skin stimulate the cold and heat receptors respectively. By receptors are meant nerve cells that receive the stimuli. The receptors, in turn, reflexively affect remote tissues, producing various functional changes in the tissue. The greater the difference between the temperature of the water and the temperature of the skin, the more intense is the thermic stimulation. Furthermore, mechanical stimulation produced by the impact of the water in showers, in douches and in sea-bathing or by friction, active exercise, etc., in conjunction with baths, influences considerably the effect of the water.

The types of baths are many. Water may be applied therapeutically in the form of plain, artificially medicated or naturally mineralized water. It may be in the form of a full or partial immersion in a tub, spray or douche, with or without massage and manipulation. Water vapor may also be utilized locally or generally.

While the immersion of the whole body in a tub bath brings all the parts under the influence of the temperature of the water, a general effect is also produced by a partial submersion as the action of the water is not confined to the submerged parts. The same holds true for spray and douche, which produce an additional stimulation from the impact of the particles of water.

Baths according to temperature vary from very

cold baths through neutral, lukewarm to very hot baths. Heat and cold are, of course, relative terms and are therefore not particularly scientific. For this reason many authorities prefer to use the number of degrees rather than the terms hot and cold. For our purpose, however, it will be sufficient to designate the baths as hot, cold and neutral.

Full immersion baths of any temperature are taken in a tub which contains about forty to fifty gallons of water. If you have a feeling of oppression or a headache from the water, regardless of temperature, take the precaution of wrapping your head in a towel wrung out in cold water.

The mechanical action of water depends upon the pressure of the water on the parts immersed and the resistance offered by different parts of the circulatory system. The veins and capillaries are most affected and the great vessels the least, since their walls are under greater pressure. The smaller arteries, however, are also under influence of the external stimulation. The net result of the water pressure is to increase the circulation and the work of the heart. In regard to the abdomen, the result would be to decrease splanchnic stasis—impacted feces in the last end of the colon. The pressure on the thorax favors expiration at the expense of inspiration, which is hindered by the failure of the diaphragm to make its full expiration.

On the whole it may be said that where all factors tend in the same direction, the pressure of the water increases the work of the heart, lessens abdominal stasis and decreases inspiration.

The thermal effect naturally varies with the tem-

perature in the bath and will be treated subsequently when we describe the various types of baths.

Cold Baths

Let us first consider the effect of full immersion cold baths. If you are brave enough and hardy enough to enjoy such a bath, you'll be wise if you take the precaution of sponging your neck, head and chest with water of a temperature below that of the bath if possible. This mitigates the initial shock. If the immersion lasts more than a few seconds, rub your body vigorously the whole time. But under no circumstances remain in the tub more than three minutes.

The action of a cold bath depends upon the mode, length and intensity of the application. With short moderate immersions the blood vessels of the skin are at first contracted, the skin pales and roughens. Since the surface vessels are contracted, there is a rise in blood pressure. The pallor leaves after a short time and is replaced by a redness due to the relaxation of the vessels. The more intense the cold, the greater the reaction. This is also true in the case of a cold shower which has the added effect of mechanical stimulation.

With the initial constriction of the surface vessels and the inhibition of sweating, heat elimination is greatly diminished. However, when the reaction takes place, the heat of the body escapes through the skin and the temperature is lowered. The drop in temperature lasts for only a short time, since the voluntary and involuntary or "shivering" movements result in an increased production of heat. In fever conditions there is a more lasting fall in temperature.

The cold bath also has a combined effect of both

resting and exercising the heart, but such a bath should never be indulged in if a person has a weak heart.

Cold water at first produces deep inhalation with a momentary arrested respiration at the height of inhalation, followed by deep exhalation. This effect is usually known as gasping. If the application is prolonged, the respiratory movements continue to remain deeper and frequency is increased. The excretory function is affected in still another way—diuresis or excretion by the kidneys is increased.

Cold water tends to prevent muscular fatigue and to restore normal tone to fatigued muscles. Mechanical stimulation, such as vigorous rubbing of the body or applying the water in the form of a shower, tend to heighten this effect.

Most of the reactions which we have just described are brought about through the nervous system. Cold baths of short duration tend to increase the sensibility of the nervous system. The central nervous system, too, is decidedly influenced, as witnessed by the feeling of refreshment and heightened vigor after a brief cold bath.

Cold baths are used to reduce temperature in feverish persons but in normal individuals they are largely confined to use after a hot bath in order to tone the skin. It is an excellent form of stimulation for healthy persons and is efficacious in cases of obesity where it is used to increase metabolism or the burning up of tissues for energy. Highly irritable, nervous individuals respond irregularly to cold water. For the most part they respond poorly, although some have an excessive reaction. Cold baths should not be used

in the case of the very young and the very feeble. They are also contraindicated in febrile conditions which are due to inflammation of internal organs, arteriosclerosis and kidney disorders. And remember, even if you are in the very prime of health, if you have an unfavorable reaction, or no reaction after a cold bath, that is, if your skin isn't pink and smooth and supple, if you have no increase in perspiration and above all, no sensation of well-being, warmth and renewed vigor, by no means even think of indulging in this type of bath, despite the advice or proud boastings of friends. Hot baths are equally beneficial, and most of the effects resulting from a cold bath can be obtained through some form of the hot bath.

Hot Baths

Very hot baths cause a momentary constriction of the blood vessels of the skin, giving rise to pallor, the sensation of cold with shivering, and in some instances "goose flesh." The pallor and roughness of the skin last for only a few seconds and quickly give way to a dusky redness. A moderately hot bath is not accompanied by these phenomena—there is no initial pallor or shivering.

The general application of heat causes a rise in temperature if it lasts long enough and if the evaporation of sweat is interfered with. The less the application of heat impedes the evaporation of sweat, the less the body temperature is apt to rise. Generally speaking, however, in a full immersion bath, since the evaporation of sweat is retarded, heat accumulates in the body and there is a rise of body temperature over skin temperature after a few minutes. A plain

water bath of 104 degrees F will raise the internal temperature about five degrees, i.e., from about 98 degrees to 103 degrees F.

On the other hand, a quick hot bath will lower temperature. The reason for this lies in the fact that the heat production is diminished and its elimination encouraged by increased perspiration, relaxation of the surface vessels and increased activity of the heart. You yourself have experienced the delightful and refreshing coolness following a hot bath on a stifling summer's day or after a hard muscular exertion. It is the same principle that underlies the cooling effects of a cup of hot tea or hot soup in contrast to iced tea or ice cream.

Heat also tends to increase metabolism, provided it is intense enough to raise the body temperature. The mechanism is similar to that in the case of cold water.

The contractile elements of both the blood vessels and the skin relax under heat. With the first shock of immersion and the transitory spasm of the cutaneous blood vessels, the tonus of the heart is increased by the raising of the pressure in the systemic vessels. The pulse increases in frequency and the tone of the heart muscles is probably lowered. Within a short time, with the dilation of the peripheral vessels, the blood pressure falls. The higher the temperature and the longer the duration, the more pronounced are the changes. As in the case of cold water, mechanical stimuli enhance the effects.

Likewise, as in the case of cold water, the frequency of respiration is increased, but to a less marked degree. The breathing is usually shallow. The sweat, sebaceous glands and the kidneys react readily to heat,

so that the hot bath has a tendency to hasten the elimination of toxic substances.

As to the nervous system, warm baths of short duration have the same effect as cold baths, that is, they increase the sensibility of the nerves. Heat, however, is usually more effective in lessening pain than cold. Generally speaking, baths at a high temperature are at first exciting, but later cause exhaustion, muscular weakness and a disinclination to muscular work. If prolonged, vertigo and nausea may be provoked. On the other hand, hot baths of a short duration have a reviving effect in cases of exhaustion following severe muscular exertion. This may be due to the elimination of the waste products of muscular activity.

Hot baths of increasing temperature followed by a cold shower (if permissible) are excellent for those sensitive to cold. They also are good for diffused pain such as associated with diseases of the viscera, dysmenorrhea, bronchitis, gallstone colic, renal colic and many rheumatic conditions. They have a wonderfully relaxing effect after a hard day's work or after a severe muscular exercise and are superior to cold baths when one wishes "to cool off." However, they should not be taken in cases of organic diseases of the central nervous system, myocardial weakness, cardiac hypertrophy or arteriosclerosis.

The Sedative Bath

In addition to these baths which vary markedly from the temperature of the skin, there is another bath, a bath whose beneficial effects are well known amongst the medicos, but which is sadly neglected by the average person. However, when its delightful

effects are once experienced by an individual living under the stress and strain of modern city life, it has found a life-long strong advocate. This is the neutral or skin temperature bath, probably the simplest and easiest to obtain of all baths. Why it is so little known is difficult to say. It is probably due to the innate tendency of human beings to look far off and choose the difficult and complex while neglecting the simple remedies at hand.

Now the very sign of life, says a well-known authority, is the irritability of the cells, tissues and organs when they are exposed to physical or mechanical influences. In this connection we have just showed that a stimulating or exciting effect on the circulation and a tonic effect on the heart and blood vessels may be brought about by the use of water considerably above or below the temperature of the body surface.

But you yourself have not always wanted to produce such stimulation, and perhaps you have even foregone your daily bath because you were worn and weary from and of stimulation and were blindly seeking a sedative effect. Such an effect may be brought about by lowering the normal amount of stimulation. In this way the bodily functions can be retarded and sometimes fully stopped. This task of soothing excitement, that is, bringing about a sedative action, is more difficult than stimulation and sometimes it is necessary to resort to indirect methods to exclude irritation rather than directly induce calm.

One of the principal and the safest means of producing a sedative action is through a bath of skin temperature. This is a bath which approximates as closely as possible the temperature of the skin which

lies somewhere between 93 degrees and 96 degrees F. This is known as the point of "thermo-indifference" because there is no irritation of the skin nerve endings by hot or cold. Neither is any change produced in the circulation, in the heart action, blood pressure or respiration. Therefore its physiological effects may be said to be mainly negative.

However, while the physiologic action of the skin temperature bath is largely negative, it is far from negative with regard to its beneficial effects on an overtaxed nervous system. On the contrary, it has remarkable sedative effects. The rather long continued contact of the skin with the lukewarm water causes the blood supply of the peripheral system to increase, with a corresponding decrease in the deeper parts. As a result the intra-cranial vessels are more or less emptied and continue in this state for some time. The local effect of the water on the nerve endings in the skin plus the diminished blood supply in the head and elsewhere produces a sedative, even hypnotic effect.

The longer the duration of the bath, the more pronounced are these effects. And there is an added effect —the secretion of urine is increased if the bath is prolonged from one to two hours. In short, the effect of skin temperature is limited to soothing and relaxing the nervous system.

Therefore, as the effect of a skin temperature bath is principally a soothing one, such a bath is indicated in all conditions where a soothing, sedative effect is desired, as in cases of nervous irritability, sleeplessness, anxiety neurosis, functional neurosis as chorea, and certain diseases of the central nervous system

accompanied by spasticity. Persons suffering from any of these conditions bear thermic stimuli, whether hot or cold, very poorly and therefore the practice of prescribing hot baths in states where a sedative effect is desired, is, in the opinion of many authorities, erroneous. Such baths, instead of relieving, are apt to aggravate the symptoms. Multiple sclerosis and renal insufficiency are also greatly benefited by the lukewarm bath. Some authorities believe that such baths similarly constitute a very valuable therapeutic measure in reducing the temperature of infants and delicate children. Their use in paralysis and insanity are well known, as we observed at the beginning of this discussion.

But we are particularly concerned with the soothing effects of the skin temperature bath on the overworked nerves of individuals enjoying an average state of health. And no amount of verbal argument is half as persuasive as the actual experience of this bath. So, the next time you are overworked and nervous and irritable, or toss all night or count sheep, hoping to conquer sleep before dawn, try a skin temperature bath. While your tub is running, slip out of your clothes with all rhythmical leisureliness of motion depicted by a "slow-motion" movie. If you like, keep a mental picture before you of your favorite athlete or favorite horse as you saw him performing in "slow-motion" time. Then gently slide into the tub and let the water softly fold over your body. No other sensation should you feel from the water than one of touch—the touch of the finest chiffon. Lie back, with your eyes closed and your hands floating at your sides. By the end of ten minutes your nerves will be

all unsnarled and soon all sensation will leave your body—it is as one with the water. Even your mind becomes one with the water—a hypnotic dreaminess closes over your thoughts, far different from the active drowsiness of fatigue. Instead of fighting it, you are in complete harmony with one of nature's most potent forces, in its kindliest mood.

Now, as gently as you slipped in the bath, slip out of it and wipe your body with a linen or crash towel with long, slow, rhythmical movements with the least amount of friction possible. If you are going to bed, only half dry and slide into bed, being sure to cover up well, as cold disturbs sleep. And straight from the "sedative pool" you will be wafted to the land of dreamless sleep.

The need of keeping the skin temperature bath at a constant temperature cannot be overemphasized. Any variation in temperature will bring about the stimulating effects of the hot and cold bath. It should not be difficult to do this—the temperature may be regulated by keeping the faucet open just a little bit and letting water trickle in slowly—if the drain is working well it will not overflow. Or, if you have someone to assist you, part of the water may be let out of the tub from time to time and water of the right temperature be let in. If it is not possible to regulate the temperature by the faucet, a pail of warm water may set between the feet of the bather, making sure that it does not touch him. For persons in average health, this bath may last for fifteen minutes to one or two hours. Longer baths are usually taken by those suffering from some specific disease and are usually taken under the guidance of a physician.

And of course, this bath is never followed by a shower or douche.

Before closing the subject of baths, both cleansing and therapeutic, we should say a few more words on the psychological effect of bathing and cleanliness, aside from the social implication we mentioned previously and effects on the nervous system. If the effect of bathing was limited to the physical well-being of the individual, surely there would be no reason for the proverb, "Cleanliness is next to godliness." The only reason why cleanliness is next to godliness is because we feel godly after a bath. Whether you like to admit it or not, when you are freshly bathed, you slightly look down on the rest of the world and have a feeling of kindly condescension towards your fellow-beings. You are perfectly justified, for you are superior; you are better looking, your nerves are relaxed and your organs are functioning properly.

Sometime ago, the American Journal of Physical Therapy cited an editorial which appeared in the Louisville Herald-Post, entitled "Character and Soap." I should like to quote it here:

> "A man, as you know, feels more respectable after taking a bath, whether he takes it every morning or on Saturday night. That's why he sings as he takes it. He's giving three cheers for himself. When a man feels respectable he is prompted to act that way. He becomes ambitious—that is, he feels an urge to improve himself and the world.
>
> "At a certain age a boy begins to take an interest in keeping clean. Psychologists call it 'the religious age.' It is, in fact, the age when he begins to comprehend and appreciate ethics. It is the blossoming of character.

"In the Tropics a man who plunges into a river may have no other desire than to get cool. When the early Nordic took his first bath in a snow-covered hut, his desire was to get clean.

"Of course some character was necessary to inspire the yearning for cleanliness, but the habit of taking baths under unfavorable conditions must inevitably have developed character. It was the necessity of overcoming difficulties that made the Nordic master of the world.

"Any old soldier will tell you that a smart and barbered regiment will fight better than a slovenly regiment. The first sign of weakening morale is indifference to dirt. Ask the man at the morgue. Ask the police. Ask the reporters. It seldom happens that a suicide has recently bathed.

"If it is necessary to find a new foreman quickly, go out to the shop and select ten men who shave every morning. Then pick the one who bathes every morning. He is a comer."

CHAPTER VI

SLEEP

"Oh, how I hate to get up in the morning!
Oh, how I love to remain in bed!"

Most of us remember the World War song that began with these words, and most of us frankly or reluctantly admit that the words quite aptly fit ourselves. We secretly envy and at times resent those rare individuals who hop gaily out of bed at the first tinkle of the alarm clock—if they use one at all—and blithely go about the business of setting up exercises, bathing and dressing, bubbling over with bright remarks and song. We doubly resent and envy them if they boast of the fact that they require only five or six hours of sleep a night.

It really is a waste of thought and emotion, for if you but observe the five-hourers through the day, you'd be almost sure to find out that they are unwittingly misrepresenting themselves. They usually fall into one of two groups. The first group comprises those who, while it is true that they sleep little at night, have a remarkable facility for dozing at odd intervals during the day, stealing little cat-naps in church, after meals, at the movies, even in subways, trains or automobiles. If you could keep accurate account of these naps, you'd find that, all in all, the

five-hour sleepers actually sleep more than the eight-hourers.

Most of the members of the second group have an abundant amount of what is popularly called "nervous energy." They work and play with intensity and never seem to relax. At regular intervals they find it necessary to take a prolonged vacation or a rest cure. And they are only too ready to assure you that the reason why they need the rest is not because they need sleep, but because they have worked harder than any one at the office, or in the home.

The truth of the matter is that nature has endowed all animal life with the faculty of sleeping, and for very definite reasons. It is during sleep that poisonous, toxic substances are given off; it is during sleep that most of the building and repairing of tissues takes place; and it is during sleep that we are afforded a surcease from mental cares.

Hence to try to avoid sleep is sheer folly, if we have any regard for health. Moreover, we must get the same amount of sleep every night. We may slip up on our daily ration of vitamins or calories, we may slip up on our daily bath now and then, and make up for it later without any ill effects. But we cannot slip up on our quota of sleep without permanent effect, for science has proved that it is almost impossible to make up for a loss of sleep. While it has not been accurately determined, scientists say that it takes about two weeks to make up for a single hour of loss of sleep.

The first question usually asked when the problem of sleep is a topic of discussion is, How many hours of sleep should I get? There is no hard and fast rule

to follow. It is up to you, as an individual, to discover the number of hours of sleep which help you to maintain your best health, and then stick to them. If you don't know how much sleep you require in order to feel your best, do a little experimenting. Try sleeping an hour more for a week, or an hour less, and watch the results. If you get up feeling refreshed and are able to keep alert and cheerful during the day, you are in all probability getting enough sleep. On the other hand, if you get up feeling tired and groggy, and are "all in" towards the end of the day, you may be sure that you are not getting enough.

While no rule can be given that suits all, the proverbial eight hours seems to be adequate for most adults. Children, of course, require more, and very often elderly people feel better with a smaller number of hours of sleep, at night, at least. One's general health, the mental and physical activity during the day, and one's sex must all be taken into consideration. Robust persons usually require less sleep; hard workers need more than those who take life easily; and women usually require more sleep than men.

The second question that is often debated is, When is the best time to sleep? Night, of course, is the best time. In another chapter we have learned how vitally necessary sunshine is for good health so there is no need to expand on the subject here. But there are other reasons. The cool fresh night air is more conducive to sleep than the air of the day. Besides, it is usually quieter at night. There are many individuals, of course, who claim that they cannot sleep before the small hours of the morning, and many—particularly writers and others who do creative mental work—

claim that they are actually more "inspired" at night than during the day. This is largely due to habit—and the habit can be broken more easily than they imagine. If they would but get up at seven o'clock for a few mornings, they would soon find that no inspiration came to them after ten o'clock and would be only too willing to retire shortly after.

The third question is, How can I get the most restful sleep? There is no mystery about a restful sleep—it is within the reach of all normally healthful persons and of most persons who are not so fortunate.

First of all, never try to sleep immediately after a heavy meal—you'll be sure to toss through many precious hours, or to dream. On the other hand, don't go to bed hungry. In another chapter we shall learn why. Suffice to say here, that a glass of warm milk or beef tea, or dish of a light prepared cereal is conducive to sleep because it stops the hunger contractions of the stomach and draws the excess blood away from the brain.

Secondly, be as relaxed mentally and physically as possible. This is easier than you might imagine. Frequently it only requires a little will power. As soon as you start undressing, drop all unpleasant and exciting thoughts. Make your body as limp as possible—just as your favorite athlete does when he isn't performing—and undress slowly and rhythmically. Those who own radios frequently find that soft, low music helps to put them in the right frame of mind. Some find that a warm bath is relaxing, and others that a long, skin-temperature bath, especially in summer, is even more relaxing. If none of these measures bring sleep—and in most cases they surely should—after you get in

bed, for a very few minutes, try working on a cross-word puzzle or reading a very short story. This should be used only as a last resort, however, for it brings the blood up to your head again and, moreover, is apt to strain your eyes.

Third, sleep in a comfortable bed. Some prefer hard beds, others soft, but generally speaking a moderately soft bed is more restful. And sleep alone. It is seldom that two persons can sleep together in the same bed without one at least suffering for it, although he or she may not be aware of it. This does not necessarily imply separate rooms.

In the fourth place, don't sleep in a cold room unless you have plenty of blankets. Cold produces a disturbed sleep. Similarly an over-heated room or too many blankets produces a restless sleep as well as heavy head in the morning.

This naturally leads to the all-important question of ventilation. It is particularly during the hours of sleep that fresh, pure air is needed, for it is then, as you will recall, that Nature is busiest repairing, building up and ridding the body of poisonous wastes. For this work she calls for larger supplies of oxygen to keep up the internal fires, but her efforts at repairing waste are rendered futile if you diminish the supply of the vitalizing element—fresh air—and compel her to use over and over again the refuse material she has already cast off.

In spite of the amount of literature devoted to sanitary matters, it is astonishing how little is understood of the principles of ventilation and its supreme importance to the general welfare. We do not refer, of course, to ventilation in its broadest scientific sense,

such as the securing of an adequate air supply in large auditoriums, but to the simple, fundamental principles of the science, with which every intelligent adult should be familiar. How many heads of families, for instance, can intelligently ventilate a sleeping room?

We would be quite safe in replying, very few. Most persons think that all that is necessary is a wide-open window. This is far from the truth. This method only permits the entrance of a certain amount of fresh air, but it does not allow the stale air, laden with carbon dioxide expelled from the lungs, to pass out of the room, except, perhaps, on a very windy night. This is because there is no circulation of the air. On the other hand, if a window is open two inches on the bottom, and about the same amount on the top, a circular current of air is set up. The fresh air enters the lower opening and the stale air, which is lighter, leaves through the upper opening. Cross ventilation, that is, windows open on opposite sides of a room, may achieve the same effect, but care must be taken that you are not sleeping in the draught often produced by this method.

And now we come to the last rule to be observed for a restful sleep, and oddly enough, it is usually the last one most persons think of, although it is of supreme importance. Do not try to get a good night's rest unless you have rid your body of the poisonous wastes clogging your intestines, which should have been eliminated during the day. When you think of the number of hours that you lie in bed, hours during which the toxic substances are being absorbed into the blood stream, the necessity for a clean intestinal tract is

obvious. If you haven't had your regular daily evacuations, may we suggest that you take a J. B. L. Internal Bath before retiring? Not only will you have a restful, soothing sleep, but you will awake in the morning feeling fresh and sparkling, for the poisonous wastes clogging your intestines have not been absorbed, but have been eliminated.

CHAPTER VII

THE DIET

When you were very, very young you ate for three reasons—first, because you were "hungry" and had dreadful gnawing pains in the region of your stomach; second, because the taste and smell of whatever you were eating was exceedingly pleasant; and third, because the grown-ups simply made you.

When you grew a little older, you ate for the same reasons, but because you were bigger, you asserted your rights and refused to eat dishes that didn't please your palate. Then you were sent to bed without any supper, to dream of mountains of ice cream, gingerbread houses and rivers of soda water. But sending you to bed was the last resort. Your parents first tried to reason with you or bribe you.

Curly hair would be yours if you would eat the crusts of your bread; spinach would make you tall; cereal gave you muscles and energy. And if you didn't have energy, you'd have to lie on a couch all day long, like the poor little boy down the street.

The energy story had the most appeal. You could visualize yourself out-prowessing the whole gang, so you manfully gulped down the oatmeal. Probably if your mother knew of what you were thinking she would have skipped the energy story, for she was

thinking of errands to the corner store swiftly done and report cards with all A's.

Nevertheless your ideas of energy were quite similar, for you were both thinking of external work. This is only one part of the energy needs of the body. It is also needed for all the internal work that is going on and for growth or repair.

Now the only source of energy we have is the food we eat. You will recall that after the food is digested and carried to the various parts of the body, it is utilized in the building and repair of tissues and in the presence of oxygen is burned to give forth energy, and as a by-product, heat.

When you stop to consider how different the various parts of your body are constructed—how hard your teeth and bones, how firm some parts of your body is in comparison to others—it is clear at once that different kinds of foods are needed for the different structures. Personal experience has proved to you, too, that certain kinds of food have very definite visible effects. Too much fat and sweet foods make you soft and flabby; too much meat seems to make you "beefy". Hence the need for a balanced diet.

Proteins, Carbohydrates and Fats

The nutritive parts of the food we eat are called the five food elements. They are the proteins, carbohydrates, fats, mineral matter and water. Recently a sixth element has been added—the vitamins. However, as they are not used directly for energy or for tissue-building they will be treated in a separate chapter.

Protein is the element of which our tissues are

made. Therefore it is absolutely necessary to eat a certain amount of foods containing protein.

The white of an egg is the purest form of protein in our ordinary foods. Naturally, since protein is the basis of all animal tissue, it is also found in meat and fish, and in dairy products such as milk and cheese. Certain vegetables contain a large amount of protein. Among such are green beans, lima beans, lentils and peas. Cereals and nuts also contain a goodly amount of protein, but fruits have only a negligible amount. Protein is absolutely essential for good health. Indeed, an adult could fare quite well on a diet exclusively protein if necessary. But he could not live on a diet composed only of fats and carbohydrates. This is because fats and starches cannot take the place of protein in the building of tissues, while protein can be used for energy.

Protein is an essential part of every cell in the body, although to be sure, it is present in relatively small amounts in bone and fat which are sometimes called the inactive tissues. On the other hand, by far the greater part of active or muscle tissue, both voluntary and involuntary are composed of protein. About twenty-five percent of the muscles is composed of solid matter. Of this about four-fifths is protein material. Thus it should be self-evident that we must eat a certain amount of protein.

Protein may also be used as fuel for muscular work if it is necessary, but at a great expense to the body, and only when other material is not available, since it is essential for the building and repair of tissues. The old idea that in some way muscular tissue is broken down when work is done is entirely erroneous.

That it is erroneous is very evident when you consider the muscles of your favorite athlete. They do not reduce, but grow in size when he is in training and doing hard muscular work regularly. The fats and carbohydrates in his balanced diet supply most of the energy; and his muscles, instead of being consumed or broken down, are in such a fine condition as a result of regular exercise that they acquire a new firmness and a somewhat larger size.

Yet, in spite of it all, the misconception still persists that foods rich in protein are "strengthening" and that an athlete or any one else doing heavy muscular work needs an extra amount of meat, especially juicy red beef, because he is doing so much muscular work and consuming so much energy. Without exercise, regardless of the amount of protein eaten, muscles remain soft and flabby.

Yet the fact is, as we have said, that although protein may be used as fuel when absolutely necessary, it is a disadvantageous and uneconomical form of fuel. This is immediately clear when you understand the fate of protein in your body. One part of the digested protein is taken from the bloodstream and built up into tissue protein material, that is it is used for the building and repair of tissues. For this use the amino acids into which the proteins are broken down in the process of digestion are kept whole and their distinguishing element, called nitrogen, is not separated from them but is incorporated in the new tissue. The protein so used represents the actual protein requirement of the body.

Now this only represents a part of the protein consumed, which is generally considerably in excess of the

protein needed for building and repair of tissues. The body must be rid of the excess protein for it cannot store protein. It must be burned up and the products of this burning or oxidation as it is called, must be excreted. But first it must be converted into a form that can be burned. The nitrogen is split off or separated from the excess protein and is changed into certain nitrogen-containing substances which are thrown off by the kidneys. The fragments which contain no nitrogen are then oxidized just as the carbohydrates and fats are. Thus the nitrogen, which was indispensable to tissue-building, becomes the very opposite when it is necessary to use protein as fuel. This is one of the reasons why protein is an expensive form of fuel. Another reason is that when protein is burned it leaves an acid ash. In another chapter we shall learn that the reaction of the body tissues should be almost neutral, with a slight inclination towards the alkaline side. Serious disturbances are likely to result if the alkaline reserve is lowered because it has been used to neutralize the excess acid.

But even if protein is an expensive form of fuel, the fact remains that a certain amount is absolutely necessary for the life of the tissues and consequently for life itself.

Carbohydrate is the general term for all starches and sugars. Indeed, the starches are nothing but many sugar groups linked together which when digested, separate into simple sugars again because the links or bonds which hold them together are broken.

Most people think there is only one sugar, the ordinary sugar, made from cane or beets, and scientifically

called sucrose. There are, however, four other sugars commonly consumed.

Glucose, also known as dextrose or grape sugar, is found abundantly in fruits and plant juices. It is especially abundant in grapes, and among the vegetables is found in large quantities in sweet corn, onions and unripe potatoes.

Fructose or fruit sugar is found in plant juices, fruits and especially in honey of which nearly one-half of the solid matter is fructose.

Lactose is the name given to the sugar found in the milk of all animals. It is less sweet than sucrose and has been found less irritating to the lining of the stomach. Many people have found it an important aid in maintaining a healthy intestinal condition.

Maltose or malt sugar is an important constituent of germinating cereals, malt and malt products.

Sucrose is not only derived from the sugar beet and sugar cane, but also from sorghum and the sugar maple. Many of the common vegetables and fruits, too, contain noticeable amounts. It is said to constitute, for example, at least half the solid portion of pineapples and of some roots such as carrots.

Starch is the form in which most plants store by far the greatest part of their carbohydrate material. It is found stored in seeds, roots, tubers, bulbs and sometimes the leaves and stalks of plants. Fully one-half to three-fourths of the solid portion of the ordinary cereal grains such as wheat, oats and rye, is composed of starch. At least three-fourths of the solids of mature potatoes is starch, but don't let that stop you from eating them even if you are overweight. Potatoes are at least seventy-five percent water so the three-

fourths starch content has little significance. Besides potatoes are highly valuable for their mineral and vitamin content.

Unripe fruits such as apples and bananas contain much starch, but as they ripen most of the starch is changed into the simpler sugars. On the other hand, young, tender corn or maize and peas contain sugar which is changed into starch as these seeds, which they really are, although we are not apt to think of them as such, ripen.

Glycogen serves much the same purpose in animals that starch plays in plants and it is therefore frequently called animal starch. It occurs in the lower as well as the higher animals, in all parts of the body, but especially in the liver which serves as a storehouse for glycogen.

The carbohydrates constitute the largest portion of our food because they are the most economical source of energy. They contain a large percentage of carbon (hence carbo-hydrates) which unites readily with oxygen, forming carbon dioxide among other elements in burning.

In the process of digestion the more complex forms of starches and sugars are broken down into the simplest form—glucose.

It is this glucose which is the fuel of the body. However, it is not used in the body exactly in this form. After it has been absorbed into the blood stream from the intestines, nearly all the glucose is carried to the liver. Here it is converted into glycogen or animal starch of which we spoke of before. Then, when any of the body tissues, the muscles, for example, need energy, the liver sends out the glycogen which it has stored.

In the muscles the glycogen is changed back into glucose, and then burned. Some glycogen, you will recall, can be stored in the muscles themselves.

In addition to serving as fuel, carbohydrates may form fatty tissue. Evidence of this is given by overweight persons who all too freely partake of candy, cereals, bread and cake and other foods rich in carbohydrates.

Fats are liberally distributed in nature and are found in both the animal and vegetable foods. They are in milk, cream, butter, whole-milk cheeses, egg yolk, nuts, and vegetable oils such as olive, peanut, cottonseed and corn oils. The fatty portions of meat and fish, of course, are largely composed of fat.

After the fat has been digested, the end-products are absorbed into the lymph vessels and then are eventually emptied into the blood stream. After a fat-rich meal tiny particles of fat may be seen in the blood.

The blood stream carries the fat to the tissues of the body. There, if necessary, it may be burned at once as energy. The same amount of fat gives forth more than twice as much energy as an equal amount of carbohydrate. However, it is not as economical for this purpose as the carbohydrate foods, and is only burned when the supply of the latter is not sufficient.

If the fat is not needed at once for energy, some of it may be converted into glycogen and stored for future use, but far the greater portion is transformed into fatty tissue and deposited about the internal organs or under the skin. These fat deposits not only act as a reserve fuel supply, but they protect the organs and hold them in place. In this way the organs

can perform their functions to the best advantage and without strain. This is particularly true of the abdominal organs—the kidneys, the intestines and the other organs are largely held in place by fatty tissue. If you need any proof of the importance of this function, just contrast the jolly disposition and good digestion of the fat man with the miserableness of the thin, nervous, highly irritable man who frequently is suffering from indigestion and sagging abdominal organs.

Fat also acts as a buffer against external jarring and injury of the organs, particularly the nerve centers. Here again is a reason for the proverbial good nature of the fat man. His large nerve centers are protected from mechanical irritation with fat.

Fat offers still another service to the nerves. Some of it enters into combination with the proteins, phosphorus and other substances to form complex compounds which are used to build nerve tissue.

The temperature of the body, as you know, is pretty constant unless one is ill. Fat tissue helps to maintain this constant temperature. It is a poor conductor of heat, and so acts as an insulator, preventing the loss of heat from the body in cold weather and preventing the rise of body temperature when the temperature of the surrounding atmosphere is above normal body temperature. You doubtlessly remember the days when your mother piled heavy, fatty foods into you when you had to brave a blizzard to get to school. She probably didn't think of fat as an insulator, but she knew that fat was heating and "stuck to your ribs".

This brings us to the last and yet one of the most important services that fat renders us, a service that every good cook knows, whether she prefer the butter

of the French, the olive oil of the Italians or the lard of the Germans. Fat both imparts flavor to and brings out or intensifies the flavor of our food. It gives pastry its delectable, tender flakiness; it imparts that delicate, fine texture to cake that makes it impossible to resist a second helping; and to everything fried or baked, it gives a crispy, golden brown crust that is a delight to the eye as well as the palate. Indeed, it is no exaggeration to say that fat is the basis of all palatable cooking. And palatability is all-essential to good digestion, as we shall soon see.

Thus we see that a certain amount of fat is absolutely necessary for good health. An excess of fat in the body, to be sure, carries serious disadvantages, but a normal amount of fatty tissue is a great safety factor. The person who is a *little* above what is considered his normal weight usually has a more stable nervous system and is less susceptible to infectious diseases than one who is underweight. Therefore the absurd reducing craze, which, fortunately, seems to be on the wane, is to be lamented. It has been responsible for a great deal of ill-health and unhappiness. The movies have been largely responsible for the craze, for our favorite stars appear to be so "willowy". This is largely a trick of photography and skillful dressing. If you don't believe it, the next time you go to the movies, carefully observe the anatomy of the actors. I'm willing to wager that even among the most sylph-like heroines, you won't see a row of buttons down her spine, or a Venetian-blind effect across her chest. A layer of fat is as necessary for beauty as for health; it is fat that gives the beautiful rounded contours and the soft, smooth, youthful skin.

Minerals

In addition to the elements derived from the proteins, carbohydrates and fats, the body is composed of mineral elements. The bones, for example, are made up of calcium and phosphorus. The brain, too, has a large amount of phosphorus. The blood contains iron and copper and the thyroid gland, iodine. All the tissues contain common salt which is known scientifically as sodium chloride.

Just like the other elements, these are constantly being broken down and excreted. Naturally they must be replaced. Therefore our food must contain them in appreciable amounts. This is imperative not only because they are needed for the building of bone, brain, blood and other tissue, but because they are necessary for other functions. They influence the irritability of the muscles, that is their power to react to stimuli. They also influence the acidity or alkalinity of the digestive juices, and maintain the neutrality of the body tissues—the acid-alkali balance to which we alluded when discussing the proteins.

Usually our diet contains enough of these elements for all purposes. Sometimes, however, as in the case of iodine in regions such as Switzerland where iodine is scarce in the water and soil, they are insufficient and cause serious bodily disturbances. The lack of iodine, for example, causes the simple goiter.

Most of our sodium chloride comes from the common table salt which we add to our food to make it more palatable, usually not realizing that our desire for it has a physiological foundation. It is particularly needed when doing severe muscular work or living in

a hot climate. This is because a large amount of the body's supply of salt is given off in perspiration. English miners may lose a gallon of perspiration containing a quarter of a pound of salt during a day's work. They know from experience that they must eat raw salt as well as drink abundant water if they wish to feel comfortable. Most of them, however, prefer to take their supply of water and salt in form of beer and ale and usually rush off to a pub as soon as their work is finished.

Babies and growing children need more calcium than adults, but it is always needed. Foods vary considerably in their calcium content, although most vegetables contain calcium. The best source of calcium, however, is milk, and of course, cheese. The table of food values gives the amount of calcium, as well as the other minerals, in our common foods.

Phosphorus is very widely distributed in the normally healthy body. Indeed, it forms a part of the nuclei of the cells and is present in the bones and nervous system. It is found in such foods as egg-yolk, brain, lean beef, cheese, wheat, oatmeal, dried beans and nuts.

It is estimated that there is only about three grams of iron in the average adult and by far the largest part of it is in the hemoglobin of the blood. As small as this amount is, it is imperative that it be maintained because there is no reserve of iron in the body as there is a reserve of calcium in our bones. It is found in appreciable amounts in egg-yolk, dried beans, peas, oatmeal, wheat, prunes and many other common foods.

Iodine is found in every part of the body, but most

of it—65 per cent, to be exact—is found in the secretion of the thyroid gland. The amount of iodine in water and food varies, we said, from region to region. When the water is poor in iodine, it naturally is reflected in the food which was nourished by that water. This deficiency results in the enlargement of the thyroid gland. This is probably a compensation on the part of the gland, an effort to increase the number of cells that it may have enough cells to extract every bit of iodine from the food.

Iodine is found in grains such as wheat, oats, corn, barley, in carrots, salmon and in a highly nutritious food not eaten very much in this country—goat's milk.

Water

Contrary to most person's belief, the amount of water in the tissues proper of the body remains quite constant. Moreover, any deviation from the total amount, no matter how slight, is very serious and may result in death if the condition is not remedied.

We all know stories of the agonies of men lost on a desert when their water supply has given out. We have seen them depicted in the movies, too, dying a slow, tortuous death. Such exhaustion and death is due principally to the decrease in the water content of the tissues. While occasionally we hear fantastic tales of persons who have gone nearly three weeks without water, ordinarily a man cannot survive more than three days at the most without water.

To increase the amount of water in the tissues, you will recall, is almost impossible. Observe that we say, *in the tissues,* and not in the body, which is an entirely different matter. The total amount of water that enters

the body through the alimentary canal has nothing to do with the amount within the tissues. Whatever water is not needed by the tissues is either immediately cast off in the kidneys or is cast off by the skin or in respiration. Tissue water is not concerned with this excess water in the blood or excretory organs.

The amount of water we need depends upon a number of factors—physical activity, external temperature, the amount of perspiration given off and the depletion of the tissue water by salty foods and saline cathartics. If you have ever tried to shake salt from a salt cellar on a damp summer's day you know what a great attraction salt has to water.

Ordinarily it is not necessary to pay much heed to the tissues' need for water as this need is most delicately regulated by the sensation of thirst. Thirst is the best indicator that Nature has given us of the water content of our tissues. And it is a far more reliable indicator than hunger is for food. Hunger pangs soon pass away in an adult, leaving only disagreeable sensations scarcely recognized as originating in the body's need for food. On the other hand, thirst becomes ever more persistent and uncomfortable, and is always recognized as a need for water.

We have three sources of water. All our foods contain water in a greater or less amount. Cucumbers, for example, contain about 95 per cent water and meat is about half water. The oxidation of food material for energy produces some water. But our greatest source is from beverages, and first and foremost among them is water itself.

Climate is an important factor, you will recall, in determining the daily intake of water. In a temperate

climate the average adult consumes from one and one-half to three quarts of water daily. Or to put it in terms of the usual way of drinking water itself—from six to twelve full glasses a day. In the tropics, or working under conditions similar to the English miners we mentioned, this amount may go up to thirteen or fourteen quarts a day.

The question of drinking water with meals and the influence of water on digestion has not been settled as yet. Some people drink a great deal of water with their meals without any apparent ill effect and others, equally healthy, drink very little. Europeans drink very little water if at all, with their meals, but their food is inclined to be moister than much of ours, and besides, they do drink plenty of wine and beer. Here in America observation seems to point to the fact that the majority drink water with their meals, or perhaps coffee or tea; and the minority shun water at such times as if it were a poison and look upon water drinkers as dissipators who will justly come to an early end.

Much of this attitude is due to a misconception of the fate of water in the alimentary canal. Water leaves the stomach almost immediately upon entering it. It goes in the upper end and out the lower almost as if it were running down a trough. The stomach may be empty or it may be full—no matter what its condition this rapid emptying of water takes place. And, moreover, when the stomach has food in it, the other foods do not leave it with the water. In other words, the water has no influence on the passage of food from the stomach to the intestines.

Therefore, it would seem that water has no influence

upon the rate or completeness of digestion. Such is the case: experiments by eminent scientists on digestion have proved that water has no influence.

When one stops to think of the meals which non-water drinkers consume, the inconsistency of their arguments that water hinders digestion by diluting the digestive juices, that it hastens the food through the stomach and out through the intestines, etc. is evident. An advocate of waterless meals will probably preach against the evils of water with meals while eating a bowl of soup which he follows with a meat course with plenty of gravy and tender vegetables floating in their own juice and tops off with a dish of ice cream. All of these foods contain a large amount of water and your stomach certainly isn't going to say to itself, "Ah-ha! This water surely comes from a glass that held nothing else. I refuse to work under such circumstances. Come, all you other members of the Alimentary Union, we are going to strike for only soup and gravy water."

No, indeed! The stomach continues to work, water or no water, and in all probability will work all the better for a little drink.

In addition to supplying the tissues with their quota of water, water helps the absorption of foods after they have been digested. It also helps to keep the bowels toned and the feces soft, thereby rendering evacuation easier. Many mildly constipated persons find that drinking one or two glasses of water upon rising helps to remedy the condition.

Water also helps the kidneys to eliminate the excess nitrogen in the body.

Therefore, we believe that you can safely drink a

moderate amount with your meals, the amount depending upon the dryness of the food. But, of course, the water should never be used to actually wash down the food that has not been thoroughly masticated, and moreover, it should not be iced.

Calories

In the course of our discussion on food, we have pointed out the necessity of eating a certain amount of each element. It is only in this way that you can achieve a "balanced diet", that is, a diet that meets all the requirements of the body.

A balanced diet is one that (a) furnishes enough energy to keep the various functions of the body going, (b) that furnishes material for the building and repair of tissue, (c) that furnishes enough water, (d) that furnishes enough mineral matter, (e) that furnishes vitamins, (f) that furnishes sufficient bulk and (g) that helps to maintain the acid-base balance of the body by furnishing the right amount of alkali-ash and acid ash.

From what we have said on the food elements, it is obvious that the body does not require an equal amount of the different food substances. It is also clear that a growing child needs a larger amount of tissue-building foods than an adult and that a laboring man needs more energy-producing foods than a man working in an office.

Thus it would seem that individually we could arrive at a diet, with a little experimenting, perhaps, that would meet the demands of our own particular systems. Such is not the case, however. If it were, there would be no overweight persons, no underweight

ones, no easily-fatigued ones and a much smaller number of cases of diseases due to malnutrition.

Fortunately, we now can scientifically calculate the amount of each food element necessary to maintain the body in good health at all ages and in every environment.

Now, no matter how varied the functions or activities of the different cells, they all use up energy. And this consumption of energy is constantly going on, simultaneously with the other functions, including the building and repair of tissues. Indeed energy is needed just as much for tissue building as it is for external and internal work. In the introductory chapter of this book, you will recall, we said that Energy is the basic principle of Life.

What could be more logical, then, than to measure the body's requirement of protein, carbohydrate and fat than by the amount of energy these elements can produce when burned with oxygen? This is exactly how we do determine the amount of food needed.

Now in the creation of energy, heat is given off and it is the amount of heat given off which gives us the measurement of the energy consumed. The unit of measurement is called the calorie. A calorie is the amount of heat required to raise one gram of water one degree centigrade. In measuring the heat-energy of the body the large calorie is used—that is, the amount of heat required to raise the temperature of one kilogram of water one degree centigrade, or one pound of water four degrees Fahrenheit.

The different food elements yield each its own number of calories when burned with oxygen. The number of calories is slightly less than the number yielded in

a laboratory test because there is some loss through digestion, incomplete combustion and other factors. So, for all practical purposes we can calculate that:

Protein	yields 4 Calories per gram
Carbohydrate	yields 4 Calories per gram
Fat	yields 9 Calories per gram

The number of calories a body needs a day varies with age, sex, activity and weight. All these factors affect what we know as metabolism. Metabolism is a general term used to cover all the physical and chemical activities of the body. Energy metabolism—the kind of metabolism we are now concerned with—refers to those chemical changes which take place when energy substances are burned in the body.

More calories are required by younger people than by old, more by larger than small, more by men than women (although the rate of metabolism is greater for women) and more by physically active persons than those leading sedentary lives. It is estimated that the average sized man uses up about 1700 calories when he sleeps, and the average sized woman, 1400 calories. Work done sitting increases the man's consumption of calories to between 2200 and 2800; a woman's between 1800 and 2200 calories a day. In moderate exercise a man consumes between 2700 and 3000 calories a day, and a woman, between 2200 and 2500 calories. In work requiring great muscular exertion a man may use up between 4000 and 6000 calories.

Generally speaking, we may say that man requires about 2800 to 3000 calories a day and a woman about 2200 to 2500 calories, this amount varying, of course, with the output of work, and with size and age.

That the number of calories should be apportioned among the three food elements—protein, fats and carbohydrates—is evident from what we said of the other uses these foods are put to in the body, as well as the processes which finally lead to their burning. No fast rule can be made as to the amount of each food consumed. It depends upon the amount of energy expended, the climate, one's digestive powers and many other factors.

The largest number of calories, of course, should be taken in the form of carbohydrates since they are the most economical form of energy. About 60 to 70 per cent of the calories should be in the form of carbohydrates.

Most of us eat too much protein, the average American diet being composed of almost as much protein as carbohydrate. Protein, you will recall, cannot be stored in the body, but the excess must be burned and the nitrogen excreted by the kidneys. This, of course, is done at great expense to the body. Too much protein may also upset the acid-alkali balance of the body, and in addition, frequently causes putrefaction of the intestinal contents. Therefore proteins should compose only 10 to 15 per cent of the diet of an adult in average health.

Fat may compose 15 to 20 per cent of the caloric intake, and except under normal circumstances it is not wise to consume more than this amount, for as necessary as fat is, in excessive amounts it is exceedingly disadvantageous. Too much fat leads to overweight—and it is much more difficult to get rid of those extra pounds than it is to put them on. Fat takes a longer time to digest than either proteins or carbo-

hydrates. Thus it naturally causes a slowing down of the emptying of the stomach and the digestion of other foods. This sometimes is of advantage as it insures more complete digestion and staves off hunger pangs. Frequently, however, it may cause indigestion. Moreover, foods heavily coated or permeated with fat may escape digestion and ferment or putrefy in the intestines. Few cooks have mastered the art of frying foods that will be digestible. All too often the fat is heated to such a high temperature that a substance is formed that is irritating to the lining of the digestive tract. It is this irritating substance formed when a fat is overheated that causes most of the cases of indigestion from fried foods, and not the fat itself.

It should be remembered, too, that fat is lacking in minerals, fiber that gives the necessary bulk to the feces, and in most of the vitamins. Therefore, if an excessive amount is eaten you are more than likely depriving your system of these elements so necessary for life and health.

The minerals do not give forth heat and energy and therefore the body's need of them is not measured in calories, but simply by weight, usually in grams or milligrams, and the daily requirement is determined by the amount excreted. Of course the amount varies with many factors. For example a growing child needs more calcium than an adult and a person who is "sensibly" perspiring more than one whose perspiration is not visible.

It is estimated that the average person requires about 5 grams of salt a day, one-half gram calcium, about one and one-half grams of phosphorus, between 6 and 16 milligrams of iron and .00014 milligrams of

iodine. Taking them as a whole, and using 100 parts of carbohydrates as a basis of calculation, we require about six parts of mineral matter.

However, there is little need to worry about the mineral matter, provided you are in average good health and are eating a well-balanced diet as far as the other elements are concerned. You're then bound to get your quota of minerals.

But remember this—no matter how careful you are about your diet, no matter how fresh the food you eat, no matter how carefully you prepare it, if your intestinal tract is not regularly cleaned of clogging, poisonous waste, you will not get the full value of your food. It will not be properly digested and assimilated and as a result your whole system—not only your digestive tract, will function poorly.

Animal or Vegetable?

Human nature isn't happy without fads. Fads are after all nothing but glorified hobbies and everybody now and then likes to ride a hobby. In the beginning of the century it was the fad for women to be plump; during and immediately after the war, thin and without any suggestion of anatomy; now anatomy is very much in evidence but the too-plump silhouette is taboo. A few years ago calories were the talk of the town, but of late they have been supplanted by vitamins.

Vegetarianism is a fad that regularly sweeps the country—indeed, so strong was it a few years ago that one of the largest restaurant chains in America ventured to go vegetarian. But in spite of the variety of dishes offered, the reasonableness of price and the

beautifully printed arguments on behalf of vegetarianism placed at each table, patronage dwindled down to such an extent that meat once more appeared on the menus. Which all goes to prove that while we might try anything once, we are at heart flesh-eaters.

With those of you whose religion forbids the eating of meat and for those of you who find that meat "disagrees" with you, we are not concerned, but to you enjoying average health and whose religion permits meat eating, we should like to say that it is our own conscientious conviction that the true solution of the question of the source of food is to be found in the happy medium. A mixed diet, that is, one of both animal and vegetable food is the best for mankind under existing conditions.

Meat is a most palatable form of protein. It insures meals against monotony, and monotony can be just as harmful as an unbalanced meal. We shall see later that palatability is an important factor in good digestion and general well-being. Moreover extractives of meat in the form of soups have a soothing, relaxing effect on the digestive system and tend to promote the flow of digestive juices. Certain kinds of meat, such as liver, have a value greater than their mere caloric value in their content of iron, copper, vitamins and other accessory food factors. Liver contains a substance which stimulates and regulates blood formation in the marrow of the bones and is therefore a specific cure for pernicious anemia. Generally speaking, too, the protein of meat is easier to digest than vegetable protein. Therefore we believe—and we feel sure that you agree—that meat is a most wholesome form of food. The only objection to it can be found

in its excess consumption, for the reasons given before. But the same objections hold true for an excessive amount of *vegetable* protein. Protein in the correct amount is absolutely essential for life and health. Indeed, you will recall that men can live on a diet consisting wholly of protein, but not one consisting wholly of fats or carbohydrates.

We feel sure that you must be convinced that a diet containing some meat is the better one, but to be on the safe side, let us examine the arguments of our vegetarian faddists.

The main argument against flesh-eating is the humanitarian one. You are familiar with all the objections—the brutalizing effect upon the human mind of so much ruthless bloodshed—of the sacredness of life, and of man's presumption in daring to deprive a living creature of existence. But with all due respect to the sensibilities of these worthy people, we are inclined to think that the argument is scarcely tenable.

First of all, at least in this country, the animals are well taken care of during their existence—far better than many human beings. Their death is immediate and therefore practically painless—which is more than can be said of most humans' death.

In the second place, the taking of life is inseparable from existence. It is simply a question of degree. There is a sect in India, the members of which are so scrupulous regarding the sanctity of life that they carefully brush every step of the path in front of them, lest they should inadvertently step upon any creeping thing. In doing this they lift the burden of responsibility from themselves for any wanton injury; but the

microscope has shown us that there is a countless world of infinitesimal life all around us, and that it is practically impossible to draw a breath, or drink a mouthful of water, without destroying some living thing. Knowing this, and still persisting in the avoidance of flesh foods, vegetarians are inconsistent, to put it mildly.

Their inconsistency is evidenced in other directions, too. Many a vegetarian will solemnly lecture you on the brutality of killing animals for foods, all the while wearing shoes made of leather, keeping his money in a leather wallet, holding his trousers up with a leather belt, and sitting on a leather-covered chair. We'd be willing to wager, too, that he wouldn't hesitate an instant to grab the leather hanger if he were standing in a speedy street car or bus that suddenly swerved around a corner. Surely, on a basis of humanitarianism, using animals as food is far more justifiable than using them for easily substituted articles of apparel and furniture.

The purely health angle has already been discussed, so that there is no need here to refute the arguments of the vegetarians. But it should be pointed out that here again they reveal an inconsistency. It would be difficult indeed to find a vegetarian so-called who did not drink milk or eat butter, cheese, eggs or dishes which contained them. Milk and eggs are just as much *animal* foods as pork, beef and lamb; and eggs, it will be recalled, are our purest form of food protein. If milk, milk products and eggs may be eaten there surely is no reason why the diet cannot be varied by the flesh of animals that produce them.

Coffee, Tea, Cocoa and Alcohol

Probably all your life you have been lectured on the evils of these beverages and unless you have personally experienced the harm they may have wrought, you have dismissed the subject with a shrug and kept on drinking your coffee, tea or whatever be your favorite beverage.

Leaving aside the question of their effects on the morals of the nation—we make no claim to be moralists—and considering the subject in the light of science, we may sum up the status of the problem as follows: Human beings would be far better off without tea, coffee, cocoa, chocolate and alcohol as they all may have serious effect upon the system; however, our lives are so conditioned that we frequently welcome the friendly stimulation of these beverages. It is more than likely therefore that we shall have them with us as long as we inhabit this earth.

Physiologists, chemists and other scientists have been—and still are—studying the effect of these so-called stimulants (coffee, tea and cocoa), both in the laboratory and on human beings. The results are most contradictory, but there are certain facts that are acknowledged as true by both the pros and cons. None of these beverages—with the possible exception of cocoa because it has a high caloric value, should be given to children. None of them have a permanent good effect, granted that they may be temporarily beneficial. And none of them, with the exception of cocoa (and chocolate) have any real food value.

It would be impossible to give the argument for and against this group of beverages—to do so would fill

volumes, so we shall have to content ourselves with a brief view of their general effect.

Coffee, tea, cocoa and chocolate have much the same action. They act by increasing the strength of the heart beat, and the output of the heart and by increasing the circulation, particularly in the brain and kidneys. The improved circulation in the brain is probably the cause of the wakefulness and intellectual activity that they produce. When taken in moderate amounts by adults, they probably do some good in improving the circulation through the heart and other vital organs. It is easy to see, however, that if the imbiber had a weak heart or kidneys or suffered from an impaired circulatory system or unstable nerves, these beverages could only be harmful.

In addition to the stimulating drug element, tea, and to a less extent, coffee, contain tannin, a powerful astringent which is strongly provocative of constipation. Its action upon the mucous surface of the stomach may be highly detrimental to that organ, as it arrests the excretion of the gastric juice by its contractile effect upon the glands. Constant, immoderate use of tea and coffee will almost invariably result in digestive disturbances, and will certainly aggravate such troubles, if previously existing.

The vast majority of you who are reading this book have seen "Prohibition" come and go and are interested bystanders or participants in the effect of "Repeal". You have listened to and given arguments on every phase of the alcohol problem—physiological, moral, sociological and economical. You have read or heard of statistics and experiments proving that alcohol increases mortality, that it decreases mental and

physical efficiency, etc.; or, on the other hand, that alcohol, provided it is taken in moderation, does no harm and moreover, that moderate drinkers are more likely to live longer than total abstainers or heavy drinkers. As a result you have either become very skeptical or so confused that you don't know what to think.

We would like to explain to you why there is so much contradictory evidence and to discuss in detail some of the most outstanding arguments of each side. We shall have to forego the pleasure, however, for to do so would fill volumes and volumes.

We have, nevertheless, made a thorough study of the question and have come to the conclusion that the human race would be far better off without alcohol in any form or any amount whatsoever. We should like to stop with this statement, but in all fairness we believe that a few, generally recognized facts should be pointed out.

Unlike coffee and tea when taken in their pure form, alcohol has a fuel value and therefore may be considered a food. It yields 7 calories per gram which is more than proteins or carbohydrates and a little less than fat. Since it is burned in the body as soon as it is absorbed, it serves as a protein-sparer, just as carbohydrates and fats do. Because of its energy value and its protein-sparing action, doctors have sometimes found it advisable to prescribe it in certain forms of serious illness.

But it must be remembered that alcohol cannot build or repair tissues and contains no vitamins or minerals. Therefore it can never serve as a substitute for food. We are, of course, referring to alcohol alone. Malt

beverages have a food value almost equal to that of milk and contain valuable mineral salts. Some of the other alcoholic beverages may have a food value beyond that of the alcohol itself, but in such negligible quantities that they could not possibly be considered real foods.

When taken in moderate quantities alcoholic beverages stimulate the flow of gastric juice, thus arousing the appetite and promoting good digestion. Hence for those who are used to it and are connoisseurs, they considerably heighten the enjoyment of a meal. Few people in this country, however, know how or what to drink, so that if they do try it, the result is only harm.

Alcohol is not a stimulant, as most people believe, it is just the opposite—a depressant. Whatever "stimulation" a person may feel at the outset of drinking is false. It is merely an impression, caused by the fact that alcohol breaks down inhibitions. The warm glow that it seems to send over the body is due to the fact that the blood vessels are relaxed or dilated thereby permitting the blood to flow through them freely, radiating heat. There may be times when it might seem wise to take advantage of these properties of alcohol, particularly since it requires no digestion, but under ordinary circumstances there is no need, and possibly harm to take advantage of them.

So much for the benefits derived from alcohol. In comparison with its evils, they seem quite insignificant. Experiments and statistics reveal that alcohol temporarily impairs memory, decreases both mental and physical efficiency and lowers resistance to disease. It has a marked effect on bodily functions, especially

those of the circulatory and nervous systems. It increases the pulse rate, but not the force of the heart beat; and since it is a depressant, it lowers the blood pressure.

It frequently seems to increase the speed of physical and mental performance, but since it reduces accuracy and uniformity or regularity, in the long run work of any kind is the poorer for it. The impression that a drinker frequently has that he has performed a task unusually well and better than he would without the aid of alcohol is entirely a delusion due to the fact that in proportion that his judgment and perspective are disturbed, his self-satisfaction is increased.

Probably the greatest harm in alcohol is its habit-forming powers, and the insidious manner in which it lays hold its victims. As the drinker becomes accustomed to the alcohol, a larger and larger quantity is necessary to produce the desired effect. The aftermath of the larger quantities is naturally worse—headache, burning stomach, dry mouth, loss of appetite, racing heart, tremors, mental depression and all the other "hangover" effects become so unbearable that the unfortunate victim resorts to more drinking to temporarily mask the effects. A vicious circle is set up which is almost impossible to break. There is no need to dwell upon ultimate damage done to body and soul —you all, we are sure, have known victims of alcohol.

And so we come back to our former statement: the human race would be better off without coffee, tea cocoa, chocolate and alcohol; there are times, however, when their agreeable, if temporary effect, is almost welcome. And since they are here on earth, what is needed is not prohibition, but intelligent en-

lightenment as to their effects when taken in varying amounts and under varying circumstances.

To say that they are dangerous when taken in moderate amount by healthy persons would be an exaggeration. Evidence against such a statement may be found in the tea-drinking Russians, the wine drinking French peasants, the coffee-drinking Swedes. Surely no one would deny the vigor and vitality of these peoples. Equally untrue it would be to deny that in excessive quantities the beverages are dangerous. And the danger can only be avoided if you know the how, when and why of drinking.

In addition to intelligent enlightenment, better standards of hygiene are necessary. It is our firm conviction that if you get plenty of sleep, fresh air, exercise, sunshine, well-balanced and appetizing meals, and above all if you keep your intestines cleaned of the poisonous wastes which sap your vitality, you will find that the coffee, tea or alcohol which was once an apparent necessity has become a pleasant luxury, only indulged in occasionally or if regularly, in moderate quantities, not as a stimulant or narcotic but as an adjunct of agreeable taste and aroma to your meal.

CHAPTER VIII

PHILOSOPHY OF EATING

A REPAST that delights the eye and whose delectable aroma and flavor tantalizes the palate and calls for more, a repast served with quiet smoothness amid pleasant surroundings and congenial companions is one of the oldest and most universal pleasures of civilization. All of us enjoy good food when we get it. Some of us frankly so; others only secretly for we either confuse—and quite naturally—asceticism with aestheticism or delicious food with rich, highly seasoned food. Such an attitude is probably a "puritanical" survival of the old pioneer days in America when food was scarce and facilities for preserving and preparing food sadly lacking. I say "puritanical" rather than Puritan, for I believe that there is plenty of documentary evidence that our ancestors knew how to prepare and eat tasty dishes when food was abundant. But if, deep down in our hearts—rather I should say, stomachs—we don't feel a well-prepared meal tasty and have no appetite, there is something wrong and we should find out what it is at once. Most likely the disturbance lies somewhere along the alimentary canal and can be treated at home. A poorly functioning colon, for example, may cause digestive disturbances accompanied by a heavily coated tongue, an unpleas-

ant taste in the mouth, headache, nervousness, general lassitude and consequent loss of appetite.

The effect of appetizing food is not merely a transitory one limited to the indulgence of the senses of taste and smell. We all know from experience that a satisfying meal is conducive to a sense of relaxation and well-being and a mood of contentment and generosity towards one's fellow-beings. The business executive, therefore, feasts his prospective out-of-town client before he broaches the subject of the terms of the contract; the younger generation restrains himself until the master of the house has finished his dinner before asking him for the loan of his new car to make an impression on his pretty new neighbor; and the charming bride learns all too soon to wait until her husband has pushed back his coffee cup and pulled out his favorite pipe before she shows him that simply adorable little hat she got at a perfectly wonderful bargain.

Nevertheless, while we all realize that nothing puts us so quickly in a happy frame of mind as flavorful food served in pleasant surroundings and eaten slowly, few understand why and how this is true, or realize how absolutely essential it is to easy and thorough digestion and general good health. Yet these factors are so important that scientists have devoted years to their study. The great Russian scientist, Pavlov, for example, has proved by his experiments with dogs that the mere presence of food is not sufficient to cause the flow of digestive juices—the "appetite juice" is the term he gives to gastric juice—a desire for food must be present. The surest way to arouse a desire for food is by dishes that look and smell and taste de-

lectable. And in order to get the full benefit of taste and smell, the food must be eaten slowly, be well chewed and not washed down with water. The economic adviser of the International Labor Office at Geneva has recently published a long-looked for report on "the worker's nutrition and social policy". According to this report, a half-hour for lunch is detrimental to the worker's capacity to produce. It results in bad digestion, nervous fatigue and increased morbidity. A full hour for lunch is advised.

Let us illustrate the effect of good food on the system with a simple example, soup. We select soup for it is the food the entire world knows, and rather than bread, should be called the "staff of life". Every country has its national soup: Russia has her borsch, Scotland her barley soup, France her onion soup and Italy her minestrone. Kings, diplomats, statesmen and maitres de cuisine are all proud of the soups that bear their names and doubly proud of those they have originated. No formal dinner is complete without a soup that tantalizes the palate. It sounds the keynote of the dinner, connoisseurs tell us, and creates the right atmosphere not only by foretelling the good things to come, but by relaxing high-strung nerves and stimulating the flow of digestive juices. Moreover, as a source of nutrition, soup has been the mainstay of peasants for centuries. Indeed, even the savage loves his soup. It is one of baby's first dishes after he has been weaned and is a source of comfort to the sick and the old and the feeble; family meals are planned around it. It has nursed many a nation through war and plague and it has been the object of many a

humanitarian foundation such as the soup kitchens that have been in existence since the Middle Ages.

Imagine, then, that you have just sat down to your evening meal. You're tired and nervous and inclined to be irritable. You don't know whether you're hungry or not. A bowl of steaming soup is set before you. You glance at it idly. It's just the color that particular soup should be. Unobtrusively you take a long sniff. It smells delicious—in fact, it actually makes your mouth water. You wish you could forego the formality of waiting for the rest to be served. Perhaps you do. You take a spoonful. The warmth is very pleasant in your mouth and you gently roll the soup over your tongue and palate, chewing the solid parts if there are any and deeply inhaling and exhaling. By doing so the flavor is sensed, for we exhale the flavor through the nose while eating, and by eating slowly the enjoyment of flavor is heightened. In the meantime the saliva which began to flow abundantly at the sight and smell of the soup is increased and the digestion of the carbohydrate portion is begun. At the same time by means of messages conveyed along the telegraphic nervous system, the stomach juices begin to flow and are ready to continue the digestion which was begun in the mouth. By the time you have finished eating the soup, all nervousness and irritability have vanished and a feeling of good-fellowship takes their place. You feel hungry, to be sure, but not in the same way you did two or three hours ago when the contractions of the stomach muscles were making you feel nervous and irritable, whether you actually felt hunger pangs or not. What has really happened is that your "hunger" has been transformed into "appetite", a pleasant,

anticipatory sensation that makes you wonder what the next course will bring forth and hope that it will be as good as the soup.

While the subject will be treated fully later, we should pause here for a moment to point out the difference between hunger and appetite. Hunger is a purely physical phenomenon caused by the contraction of the musculature of the stomach, while appetite is psychological. It is created by the reaction of the senses of sight, touch, taste and smell. Indeed, even the sense of sound may be involved. The purr of the teakettle, the gentle crackling of fat cooking, the musical tinkle of silver and glasses on the dining room table may send thoughts stomachward.

Soup, or the first course, is not the only course which stimulated the flow of the digestive juices. Any dish which delights the eye and the palate will do the same, although to a lesser degree as the meal progresses and the need for food is satisfied. And so, by the time the meal is over, you are bathed in a glow of content and you remain in it for the remainder of the evening. There is no heavy feeling in your lower regions, no regurgitation from the intestines to the stomach, no burning feeling; in short you feel at peace with the world and with yourself.

This is the ideal, of course, but it is an ideal within the reach of all of us. There is another picture, however, a picture that is seen all too often. It is noon in a crowded cafeteria. You grab a tray and take your place in line with a rushing, pushing, shoving mob. The clatter of dishes, banging of trays and babble of voices makes such a din that you can't make your order heard and in desperation you point to the nearest

dish. Then by a remarkable feat of juggling you manage to put the tray down on a table and, propping a newspaper before you, you sink into an uncomfortable seat and proceed to gulp chunks of food without chewing. You stop now and then to grope for a glass of water or a cup of coffee. Then you jump up and dash to an appointment which could just as well have been a half hour later.

What is the result? The food leaves the mouth before the starch or sugar has been acted upon by the saliva and what is more important, the dry, unpalatable mass enters the stomach in which the "appetite" gastric juice has not begun to flow abundantly. Now this psychic flow is conducive to putting the whole gastro-intestinal tract in fit condition to act on the ingested food. Partly due to the absence of this flow and partly to the unrelaxed state of your nerves, the food lies like a lump of lead in your stomach. Hence that all too prevalent American complaint—dyspepsia!

But the result is more far-reaching than that. You go about all afternoon feeling nervous and irritable and long before dinner you have a sensation of hunger which gives way to an increased irritability and fatigue, and probably a headache. Your whole digestive system is thrown out of order. Sour stomach, constipation and subsequently a poor appetite result. Such eating is false economy. Your work is slowed up when you do work, and forced vacations and doctor bills follow. The moral is—eat slowly, masticate your food well, eat food that you enjoy—and be sure you enjoy it.

Of all the factors which we have mentioned as being

conducive to good digestion, the most important one is flavor. Flavor is absolutely essential for the stimulation of the appetite juices and the appetite as well as for nerve relaxation. Its rôle in both physical and mental well-being is therefore obvious. Flavor is a subtle combination which results from the reaction of two of our senses—the sense of smell and the sense of taste. The former is probably more significant than the latter since our sense of taste is limited to sweet, sour, salt and bitter, and possibly alkaline and metal.

Many persons have the erroneous idea that flavorful food is rich food or that it is the result of mysterious concoctions whose formulæ are jealously guarded by professional cooks. This is far from the truth—flavorful food need be neither rich nor elaborate. Corned beef and cabbage can be just as delectable as a filet mignon with a mushroom and wine sauce; a cornstarch pudding can be as delicately tantalizing as a lemon chiffon pie, and probably more so. All that is necessary is absolute freshness of the raw ingredients and a little care in cooking and a little thought in flavors. This last, of course, requires a bit of experimenting if you're going in for cooking, and if you're not, the thing to do is to find a cook who suits your palate. It is essential, too, that just as much consideration be given to the combination and balance of flavors as to the balance of carbohydrates, proteins and fats. One wouldn't serve a canned pineapple salad with spaghetti with a meat sauce that is fragrant with tomatoes, mushroom, and garlic any more than one would serve a piece of snappy cheese with a custard delicately flavored with vanilla. It is interesting to observe that very often if one is careful about the

palatability of various food combinations, the proportion of the various nutritive elements will be correct. For example, few people like the combination of mashed potatoes and boiled rice, although each in itself is delicious. They look too much alike, taste too much alike and feel almost the same in the mouth. Likewise, from a scientific point of view, they should not be served together for they are both high in carbohydrates and deficient in protein.

Before leaving the subject of how to eat, the reader should be reminded of the fact that eventually poor eating habits and constipation make a vicious circle. Just as improper eating will cause constipation, so constipation will cause loss of appetite, indigestion and general ill health. Therefore, if you wish to get the full value of your food, you must be sure that your colon is functioning properly.

When To Eat

Before you read this section, pause for a moment to think over the eating habits of your family or friends and their opinion on the subject of when to eat. You'll probably remember such phrases as these: Eat when you're hungry, that's my motto: Three meals a day for me; One good meal at night, that's all I need; I don't feel good unless I have a big breakfast—plenty of bacon and eggs; I simply can't sleep if I'm hungry. . . .

So you come to the conclusion that the question of meals is a matter of individual preference, based on personal experience and somewhat influenced by the other habits of daily living. You probably have a sneaking suspicion, too, that to eat when you're hungry

is the best rule to follow. You are partially right in your first surmise, but only partially. As eating is a natural function absolutely necessary for life you should not regulate it to suit the man-made functions or occupation but suit the latter to the former. In your second surmise, you would be entirely correct, provided it was possible for an adult to know when he is really hungry. Unfortunately this is not the case with civilized man.

In the preceding section, you will recall that we hinted that appetite and hunger are very different phenomena and should not be confused. Appetite, we learned, is a purely psychological phenomenon as far as its origin is concerned. It is a pleasurable sensation arising from the memory, sight, taste or smell of food which cause the flow of "appetite juices".

Hunger, on the other hand, is a physical or physiological phenomenon that has nothing to do with appetite. It is a disagreeable sensation arising from the contractions of the stomach muscles. As the stomach becomes empty—and this somewhat contradicts the old idea that the stomach needs a rest—the muscular walls contract from ten to twenty-five times. Then it is quiet for a while—from about ten minutes to one hour in a child, and from one to three hours in an adult. Following this quiet period, the contractions start up again. The cycle of contractions and quiet periods is repeated with increasingly vigorous contractions, as the length of time without taking food becomes longer and longer.

Vigorous hunger contractions are associated with a disagreeable and even painful sensation in the region of the stomach. The contractions are so vigorous in the

infant that they frequently wake the child and cause it to cry, as many a fond father can testify. In the adult, however, they are weaker and less persistent. Even after several hours have elapsed since the last meal, they may not be recognized as such. However, they are causing serious trouble in the form of what a famous physiologist, A. J. Carlson, calls the "accessory phenomena of hunger", that is, weakness, fatigue, irritability, inability to concentrate, or disinclination to work steadily.

These symptoms can only be relieved by one thing, not rest, but food. Ask any wife what restores her husband to his cheerful self when he comes home tired and irritable after a day's work. Without hesitation she would reply Food. Would she suggest that he rest a little while before eating? No, indeed! She'd rather go without a permanent than do that.

Now there is another curious fact about hunger which you have probably already guessed. It does not depend upon the supply of nutrition in the blood stream. We shall see in a later chapter that after the food mass passes from the stomach—where only a small part was digested—it is further digested in the intestines and then absorbed. This takes a long time, and since the hunger contractions begin with the emptying of the stomach, sometimes before the digested food is absorbed, hunger or the symptoms of hunger, does not necessarily mean that the body is crying out for food. This is important for it shows that it is not necessary—in fact, it may prove unhealthful—to eat a full meal every time you eat or to adhere to the old rule of three meals a day.

The three-meals-a-day rule, so convenient for the

modern factory system, is undoubtedly a heritage from our pioneer forefathers with whom it was a question of saving time, energy and food itself, and quite without physiological foundation. Even if such a rule has scientific foundation—and many eminent authorities believe that it has—it would be absurd to compare ourselves with our ancestors. The noise, dirt, bustle and other over-refinements of our modern life would kill them off as quickly as the Indians, rustic cabins without telephone and plumbing and bitter cold would kill us.

Seriously considering, then, the various aspects of hunger, we would like to suggest, that instead of eating only three times a day, you eat five or even six times. We honestly believe that you will feel much better since by doing so you avoid the headaches, fatigue, irritability and all the other phenomena which torture your mind and body when your stomach is empty.

But don't misunderstand us. We don't want you to become a nibbler. Constant nibbling is even worse than eating only one meal a day. You're bound to either undereat or to overeat, and in any case, it's more than probable that you won't get a balanced diet. We aren't rabbits, so our nibbling doesn't consist of nibbling carrots and lettuce that are full of vitamins and minerals and other nutritive elements; it usually means candy and cookies and other foods rich in carbohydrates that spoil our appetites for other foods and certainly aren't balanced in themselves.

On the other hand, we don't mean that you should sit down to five formally served meals. That would be

impossible for the average person and usually would signify overeating.

What we do mean is that you should take a snack between meals—at least between luncheon and dinner, for there is usually a longer time between them than between breakfast and luncheon, and besides, you're not quite as fresh as you are in the morning—and before you retire.

These snacks should be nutritious, easy to digest and not likely to spoil your appetite for your principal meals. A glass of milk, a cup of soup or a piece of fruit is good. If you feel more fatigued than usual, eat a piece of chocolate, or better still a piece of candy made of dextrose (corn sugar), as it is quickly digested and assimilated and will give you "quick energy".

Of course, whether speaking of the principal meals or the snacks, the rules we laid down in our discussion of how to eat, hold true. Pleasant surroundings, proper mastication and all the other laws of good eating must be observed.

We trust that the reader realizes that all we have said on the subject of eating pertains principally to the persons who are enjoying average health. Some of them apply to the sick, as well, but not all. A sick person, naturally, needs pleasant surroundings, appetizing dishes and the other things we talked about in the philosophy of eating. But an invalid, a convalescent or one in the throes of a disease requires a special diet. He also may need nutrition as often as every half hour. Generally speaking his meals should be light, nutritious in quality and small in quantity, so as not to impose a too great burden at one time on the weakened digestive apparatus.

But in its essentials our message is the same to the vigorously healthy, the middling healthy and the sick: eat a diet balanced according to your needs, eat food that you enjoy, eat in pleasant surroundings, eat often enough and keep your digestive tract and your bowels in good order. Then it will be yours to keep your good health or improve your not-so-good health.

CHAPTER IX

THE VITAMINS AND THEIR IMPORTANCE IN HEALTH

Let us go back in imagination to the year 1250, when the Seventh Crusade under that noble king, Saint Louis, was invading the Near East. A happy, hopeful band—it had left France a short time before, each member sure that he would win his heart's desire, whether it was wealth, fame, love or oblivion. Most of them were young and all were tightly bound together by two of the strongest ties—religious fervor and vibrant health.

How the picture changes when once the deserts of Egypt are reached! But let de Joinville, who was Louis' biographer, tell us the story.

> "While we were in camp," he wrote, "the only fish we ate during the whole Lenten season were mudfish and the mudfish ate the dead. . . . And because of this misfortune, as well as the evilness of the country where not a single drop of rain falls, we fell sick . . . with a sickness that made our flesh and limbs dry all up, and the skin of our limbs become spotted with black and the color of the soil, just like an old boot . . . and the gums rotted; and no one contracted this malady but that he had to die of it. When the sign of death came—a bleeding nose—one had to die . . . there was so much dead flesh on the gums that the barbers had to cut it away so that our men could chew their food and swallow. It was horri-

ble to hear the men moaning when their flesh was cut away, for they moaned like women suffering the pangs of childbirth. . . ."

This is one of the earliest descriptions of scurvy or scorbutus, a disease caused by the lack of Vitamin C. It was probably known in the northern parts of Europe and Asia ever since they were occupied by man—and it still menaces us.

Our knowledge of beriberi, another vitamin-deficiency disease, goes back even further. In old Chinese chronicles written almost 4000 years ago we find vivid descriptions of that disease.

Nevertheless vitamins themselves remained undiscovered and a mystery until 1912. Indeed their magic and mystery haven't been yet fully solved; so that anything we say today may be disproved, or at least modified, tomorrow by further revelations of medical science.

The vitamins, like the proteins and other food essentials, are chemical compounds. They differ from the elements that build tissue and supply energy, however, in that there is a far greater difference in the proportion between their nutritional functions and the amount necessary to perform them adequately. A man weighing 160 pounds has been estimated to require about 70 to 100 grams of protein daily, but his vitamin requirement is expressed in terms of milligrams! Sir Francis G. Hopkins, who has done much to help the cause of vitamins, as we shall see, estimated that a single ounce of Vitamin C would be sufficient to prevent 500 human beings from getting scurvy for a whole year.

Today we know of at least thirty vitamins, each of which has its own chemical structure and its own definite functions to perform in the human body. Taking them as a whole, however, their functions may be divided into three broad classes. They promote the normal growth and development of the body, they protect the body against diseases and then insure the proper functioning or regulation of the bodily processes, including metabolism. And when the diet is deficient in one or more of the vitamins for a sustained period of time, grave diseases develop which may result in death.

The discovery of the vitamins is a fascinating story, and as it is one that helps to clarify their significance, let us pause here to relate the history of the discovery of these tiny but supreme rulers of our bodies.

The first glimmering that we needed something more than proteins, fats, carbohydrates, minerals and water in our diet to maintain life came in the 1880's. Before then chemists and physiologists had devoted their time to the study and analysis of proteins, carbohydrates and fats and it was the prevailing belief that they alone were essential to maintain health. But as time went on and experimental methods improved, it became obvious that a diet may contain the correct amount of calories and the proper balance of proteins, fats and carbohydrates and yet fail to meet the full demands of nutrition. To be sure, it had been observed for centuries that a diet of preserved foods or old foods would cause scurvy amongst soldiers, persons on long sea voyages and inmates of prisons. Experience had proved, too, that if certain fresh vegetables or fruit, such as oranges and lemons, were

added to the diet, scurvy disappeared or was prevented. It was observed also that beriberi developed amongst the rice-eaters of the Orient. But no one had been able to find out why this was true and most persons still held to the belief that these diseases were caused by "germs".

Then, about 1880, a quiet young scientist, but one with imagination, who was working in the laboratory of Dr. Bunge at the University of Basle in Switzerland, began experimenting with mice on a diet of milk. He fed some of the animals on natural milk and others on synthetically prepared milk containing all the elements in exactly the proportion as they occur in natural milk. The mice fed on the natural milk thrived but those fed on the chemically prepared milk soon died. He repeated the experiments, only to get the same results. He came to the conclusion that natural milk contained some mysterious, elusive substance—a substance which was absolutely indispensable to life and which was undoubtedly destroyed in the process of preparing the synthetic milk. While these experiments of Lunin did not create much excitement, they reawakened an interest in nutrition and it marked the beginning of a series of dramatic discoveries that have offered new life and hope to humanity.

Such was the beginning of the discovery of what was first called "accessory food factors" by the chemists. The medical profession, however, especially in the East, was constantly coming in contact with gruesome, death-causing diseases which were apparently due to dietary deficiency. About the time that Lunin was working in Switzerland, Takaki, the medical inspector-general of the Japanese navy, was making a study of

beriberi which was playing havoc with the Japanese navy. Beriberi is characterized in its initial stages by a catarrh and swellings and pains in the limbs which soon become paralyzed. As the paralysis gradually creeps over the whole body breathing becomes very difficult and before long the victim dies.

Takaki, firmly believing that the disease was not an infection, as was generally believed in his day, but was of dietary origin, made a comparison of the diet of the Japanese navy when it was on long voyages and those of the European nations. He found that the Japanese diet, consisting largely of "polished" rice, contained a much greater amount of carbohydrate and a much smaller amount of protein than those of the Europeans. He therefore recommended that the Japanese cut down on the polished rice ration and substitute unpolished rice and a larger complement of foods richer in proteins. Of course, his advice was scorned. He bided his time, however, for an opportunity to put his theories to a crucial test. The opportunity soon came.

While taking a nine months' cruise twenty-five men died on board a Japanese training ship. Shortly after another ship was sent on a cruise over the same route. This time the navy acceded to Takaki's earnest pleas. The ration contained fresh milk and meat and unpolished rice—that is, rice not deprived of the husk. As a result, during the whole ten months that the crew was at sea only fourteen cases of beriberi developed and only in those men who had refused to accept the changed diet. Needless to say Takaki became a national hero.

Takaki, however, believed that protein—as con-

tained in milk and meat—was the cause for the decrease of beriberi. He had missed this important fact, that it was the unpolished rice which contained "the preventive factor".

Then, in 1897 a startling discovery was made by a Dutch physician, Eijkman, who was stationed in the island of Java in care of prisoners. Among his prisoners Eijkman had many patients suffering from nervous disorders, strange swellings on their limbs and a certain incoordination of movements, symptoms similar to those of the Japanese sailors. It happened that he had a large number of fowls which he was using for some experiments. One day they all fell sick with much the same symptoms that his patients had. He called the disease polyneuritis to distinguish it from the form found in human beings. Learning that they were being fed cooked rice left over in the hospital kitchen, he replaced their diet with one of raw, unhusked rice and the fowls quickly recovered.

Eijkman then tried substituting unpolished rice for the polished rice amongst his patients who were suffering from the same disease, with the same result. He came to the conclusion—missed by Takaki—that the outer covering of the rice kernel contained some substance which acted as a protector against polyneuritis, although he did not know it as a vitamin.

In succeeding years further studies were made by physiologists and biochemists in addition to the research done by doctors.

In the meantime, however, this latter group of scientists continued their researches and as early as 1905, Pekelharing of Holland observed that if a little natural milk was added to a diet which contained well-

balanced proportions of proteins, carbohydrates, fats and minerals, mice would not only live but would achieve a remarkable growth. The following year, Hopkins of England wrote that some minor factors in the diet were essential to life and the prevention of diseases such as scurvy. Six years later he published an account of his findings and called the substances in milk which were necessary for life, "accessory food factors". The year before, however, a German by the name of Funk, who was making a study of polished rice as a cause of beriberi, gave the name to the missing factor, "vitamine", derived from the Latin word for life and *amine*, because he thought the missing factor had something to do with protein and nitrogen. The word was soon accepted by the world of science and the factor necessary for the prevention of beriberi became known as Vitamin B. It was soon discovered that protein had nothing to do with vitamins, so, in 1922 Drummond suggested that the "e" be dropped in order to avoid confusion.

In the meantime in the United States two groups of experimenters were working independently on "the unknown substances essential to life". Osborne and Mendel at Yale devised a preparation of "protein-free" milk to which they added mixtures of pure starch, sugar and fat. They fed this mixture to white mice who kept alive for a longer period of time than ever before. But after a period of about 100 days, it was impossible to induce any increase in weight in the animals. When whole milk powder was substituted for the protein-free milk, the animals survived two generations.

They concluded that the difference was in the milk

fat and substituted butter for lard. Those fed on butter-fat attained normal size.

While Yale scientists were proving that milk fat contained an element essential to growth, McCollum and Davis at the University of Wisconsin were experimenting along the same lines, and found that animals fed on purified casein, carbohydrates, lard and various salt mixtures were stunted in their growth, but that the same animals regained their vigor and normal growth when fed on egg-yolk fat or butter. They called this essential accessory food factor "Fat-soluble A". It is now generally known as Vitamin A. Many long and weary years had been consumed in the search for this unknown, but the scientists were amply rewarded: it was now established beyond doubt that butter fat and egg-yolk contained something necessary for normal growth that was not found in lard and the common vegetable fats.

Two years later the same experimenters, McCollum and Davis, discovered that if they replaced the milk sugar in their ration with starch, the animals no longer continued to grow, in spite of the fact that the diet contained sufficient butter fat. Moreover, the animals developed a paralysis which closely resembled the polyneuritis of the fowls with which Eijkman had experimented. When natural foods were added to the diet, the paralysis disappeared and the animals assumed their normal growth. The scientists discovered this time that the curative substance could be extracted with alcohol from the wheat germ or embryo. They called it "Water-soluble B" to distinguish it from Fat-soluble A. It was soon found that it was identical with Funk's substance and is, as we have

said, now known as Vitamin B. Since that time, it has been found that Vitamin B is in reality a complex made up of more than one substance, each of which, as we shall later see, having its chemical characteristics and functions.

Oddly enough it was not suggested, however, that scurvy was due to a lack of a third essential food factor until 1913, and not until two years later was it pointed out by Dr. Alfred F. Hess that this potent factor was also contained abundantly in tomatoes. Some years passed and in 1919 it was definitely established that there really was a third accessory food factor—Vitamin C.

During this time research was being carried on in another direction—research on the relation between bone growth in children and their diet. This led to the identification of Vitamin D in 1922. The following year Vitamin E, necessary for reproduction, was discovered. Since then many new important discoveries have been made about the nature of the vitamins and their functions, such as the discovery of the pellagra-preventing vitamin G or B-2 by the late Dr. Joseph Goldberger in 1926. Nevertheless, there is still much to be learned, and probably much to be unlearned. Bearing in mind what has just been said, let us examine each of them in turn and see what, in light of present knowledge, they do for us and where we can best find them in our foods.

As all-efficient as man likes to believe himself to be, he could not exist without the aid of plant life, for the ultimate source of all vitamins and other necessary organic substances is the plant. This is true even when we eat the flesh of an animal or fish, or butter or milk.

The cow, for instance, eats the fresh sweet meadow grass that contains the vitamins or their precursors and then metabolizes them in a concentrated, convenient form for us. Neither we nor the vast majority of animals can synthesize all the vitamins or other organic substances necessary for the maintenance of life. We are therefore ultimately dependent on the plant world for our very existence.

Vitamin A perhaps illustrates this point better than any others. Besides the two forms of vitamin A—A_1 and A_2—there are at least nine precursors of vitamin A, of which only five are known to be in our ordinary foods. These five are the carotenes, alpha, beta, gamma and kappa; and cryptoxanthene. These precursors, or provitamins, are converted by the liver into vitamin A, and it takes many more units of these to equal a given unit of vitamin A.

Carotene is the yellow pigment in green, yellow, orange and bright red fruits and vegetables; the deeper the color is, the richer the food source. Indeed, the very name "carrot" calls to mind the word "carotene."

Vitamin A has a potent influence on general growth and vigor and is believed to increase the span of life. It is mainly a stimulus for the formation of new cells. It helps to preserve the normal vitality of epithelial tissue, aids in maintaining a normal functioning of the glands, and—what is very important—it helps to maintain resistance against many dread diseases, such as xerophthalmia, a horrible disease of the eyes which may result in blindness; tuberculosis, influenza and other respiratory diseases. To motorists, aviators and others who use their eyes a great deal in varying

conditions of lightness and darkness, vitamin A has great import for visual keenness and ready adaptation to semi-darkness. This vitamin also plays an important part in the formation of tooth enamel.

By influencing and preserving the normal growth of epithelial cells, vitamin A acts as a first line of defense against the invasion of disease-bearing bacteria. When there is a deficiency of this vitamin, the epithelial cells not only begin to lose their power as defenders against disease, but they also become hard and horny and offer an ideal opportunity for the growth and development of germs. The delicate mucous membrane linings of the mouth, the alimentary canal, the nose and sinuses, the kidneys and gall bladder are among the first to suffer. The tear glands, too, no longer produce tears and as a result, the eyeball and tissues of the underlying glands dry up. Xerophthalmia develops and if the cornea is attacked, the victim becomes blind.

Fortunately there are but few instances of xerophthalmia in the United States, although cases of night-blindness caused by a mild deficiency of vitamin A are frequent. Children, especially, seem to be victims of night blindness, but when a carefully selected, well-balanced diet to which cod liver oil is added, is given them, this clears up.

Before continuing the discussion of vitamin A, we should give a word of warning regarding the popular misconceptions of the role that vitamin A plays in the warding off of respiratory infections and in the promotion of normal growth and vigor. These misconceptions are largely due to advertising, probably the principal source of the average person's knowledge

of vitamins. It is rarely, particularly in the wintertime, that one can pick up a newspaper or magazine without seeing glaring headlines commanding us to eat such-and-such food if we wish to go through the season without catching cold; or, if not commanding us, threatening us with this uncomfortable nuisance or even worse. As a result, most of us get the erroneous idea that vitamin A acts more or less like an antitoxin for diphtheria or smallpox. This is far from the truth.

For the present, at least, we can only say that vitamin A merely aids in establishing bodily resistance to infections. And, an additional intake of this vitamin only aids when the supply stored in the body has been exhausted and foods eaten are inadequate in vitamin A or its provitamins.

"It certainly has not been shown to be a specific in the prevention of colds, influenza and such infections," observes the American Medical Association, "nor has it been demonstrated that ingestion of vitamin A far in excess of that necessary for normal body function and readily obtained from a properly selected diet is an aid in preventing various types of infections."

The same erroneous conceptions are met with concerning the growth-promoting powers of vitamin A. While it is true that a deficiency of vitamin A slows up normal growth when the body store of it has been exhausted, it is also true that the other vitamins, as well as the amino acids and other food elements are equally important in the attainment of normal growth.

"Statements conveying the impression that vitamin A is more important in promoting growth than any other food essentials are therefore considered misleading and objectionable," is the verdict of the American Medical Association.

We have briefly summarized the functions of vitamin A and the symptoms which result from its deficiency in the diet. They are mighty serious, of course, but don't be alarmed if perchance you haven't had your weekly quota, for xerophthalmia won't result right away, although within a short time visual acuity may diminish and night-blindness may be incurred. As the deficiency progressed, there would be a loss of appetite and a lack of vigor, accompanied by diarrhea; your skin would become dry and your body would offer poor resistance to infections; if you were still in the growing state, your growth would show signs of retardation. Not until the deficiency became very marked would xerophthalmia develop and the various infections enter through the epithelial tissues. Loss of weight, debility, and atrophy of the glands are also the result only when the vitamin deficiency is very marked.

While the ultimate source of vitamin A is the green leaves of plants, which are outstanding in their content of provitamins, in proportion to their depth of color, it was first discovered in combination with fats —butter, egg yolk and cod liver oil, all of which are rich in vitamin A. Other animal products which are excellent sources are cheese, cream and milk, fish roe, shark and halibut liver oils, and liver; good sources are beef fat, kidney, sweetbreads, the heart, herring, and oysters. These animal products cannot be judged for their potency by color.

In the vegetable kingdom we find kale, escarole, green lettuce, string beans, spinach, watercress, Brussels sprouts, broccoli, and parsley. All yellow fruits and vegetables are rich in this vitamin—yellow turnips, corn and sweet potatoes. White or pale-colored

vegetables are a poor source and, with the exception of the carrot, roots and tubers are likewise a poor source. Among the fruits the apricot and the tomato have a high vitamin A content, the latter having almost eight times as much as the orange.

Since the temperatures used in canning do not destroy appreciable amounts, the vitamin A content of most canned foods is practically the same as that of the fresh foods. It is moderately sensitive to oxidation and, therefore, when butter, for example, is exposed to sunlight for a long period, much of its vitamin A content is destroyed. Likewise, the vitamin A content of cod liver oil becomes unstable when exposed to sunlight, especially in the presence of oxygen. It is for this reason that it is sold in dark bottles and stored in a dark place.

As to the amount of vitamin A one should eat, don't bother your head about the puzzling "units" and milligrams. If you eat plenty of fresh vegetables and fruits and eggs and milk, you'll get all you need. *Just remember to eat a balanced diet with plenty of fresh, colorful, appetizing fruits and vegetables that are to your liking and the vitamins will take care of themselves.* But remember, too, that vitamin A can be stored and that when you are storing vitamin A, you're storing vigor, resistance to disease, and consequently happiness.

As told before in this chapter, vitamin B was discovered as affecting the health of nerves and joints and a preventive of beri-beri and pellagra. However, during the 1930's and early 1940's, research work brought to light the fact that the so-called vitamin B was really a whole family of vitamins that were quite similar in their effect in man, occurred in many

of the same foods and had similar chemical structure.

Since a discussion of each of the thirteen members of the B complex, known at this time, would fill a huge volume, we shall limit ourselves to the more significant and better known ones.

Vitamin B or thiamine is, specifically, the vitamin preventing beri-beri and polyneuritis. Its presence in the diet maintains good appetite, aids in the functioning of the digestive tract, which includes good elimination of waste bowel products. Thiamine is also valuable in certain cases of heart disease and in some nervous and mental upsets. It is absolutely necessary in the diet so that the body can properly use the fats, sugars and starches (carbohydrates) eaten.

The extreme deficiency diseases such as beri-beri and polyneuritis are not often seen in this country, but below-normal intake of thiamine results in conditions quiet frequently brought about by poor diet: nervous depression and exhaustion, colitis and ulcers, constipation with a general lack of muscle tone and vigor, lowered resistance to infections are some of the common evidences. Anemia and neuritis can possibly be traced to the same deficiency. A pregnant or nursing mother must have much more in her diet than normally in order to offset the increased needs in the digestive tract and in the nerve system.

This valuable vitamin is best found in compressed and brewer's yeasts, wheat germ, whole wheat bread, cornmeal and cornmeal bread, egg-yolk, legumes such as peas, beans, lentils, also in nuts, glandular meats, lean pork, whole grain cereals. Other fair sources are leafy vegetables, dark green in color; potatoes eaten with their skins; tomatoes, grapefruit, oranges, asparagus, avocados, cauliflower, mushrooms, parsnips,

pineapple, and plums. There is little loss in cookery if small amounts of water are used and the food is not allowed to wilt before cooking.

Vitamin B_2, G, or riboflavin also aids in the digestion of the carbohydrate foods, sugars, starches. It shares in the work of normal body nutrition with calcium and vitamin A; it also promotes growth. Its lack in the diet shows itself in the scaliness of the skin on the nose and forehead; in the greasy material around the creases of the nostrils; in the horny cracking around the corners of the mouth and a magenta-colored sore tongue; and in itching, burning and dryness of the eyes, granulation and great redness of the inside of the eyelids and "twilight blindness" due to a change in the covering of the front of the eye, the cornea.

People likely to have these symptoms are those with a poor diet over a long period of time, due either to lack of proper foods or to the limitations of an invalid diet not balanced properly, or those afflicted with chronic alcoholism. Good sources of riboflavin are liver, dried yeast, dark green leafy vegetables, egg yolk, milk, evaporated milk, wheat germ, enriched flour, enriched breads and enriched cereals.

Niacin, less commonly called *niacin amide* or *nicotinic acid* (it has nothing to do with nicotine), is the anti-pellagra vitamin. This vitamin aids in the use of carbohydrates in the body, as do the other vitamin Bs mentioned above. The lack of this vitamin is very wide-spread in the poor parts of the United States, especially in the South where the meagre diet consists mainly of starchy foods, with very little meat and few greens.

The symptoms of a diet poor in niacin are lesions

in the lining of the mouth and in the skin over the nose, forehead, wrists, hands, knees and feet; and the same weakened condition of the digestive tract as we described under the other B vitamins. The very advanced stages of this vitamin deficiency show a clouding of the consciousness after a period of mental disorders, and death through insanity.

Good food sources for this vitamin are liver, kidney and muscular meats, fish, milk, evaporated milk, dark leafy vegetables, and peanuts; enriched flour, enriched breads and cereals, whole grains, dried brewers', bakers' and compressed yeasts. Cooking does not destroy much of this vitamin.

Pyridoxine or B_6 is the anti-acrodynia vitamin; that is, pyridoxine prevents a certain kind of dermatitis of the hands and feet with itching and pain in these parts. Its lack in the diet is also connected with pellagra, as both niacin (the pellagra-preventive) and pyridoxine occur together in many foods. Pyridoxine is particularly concerned with nervousness, insomnia, cramping pains in the stomach, muscular weakness, and rigidity. It influences liver metabolism and the formation of hemoglobin in the blood. In the case of these last two functions, it is thought that pyridoxine is of value in some types of anemia. Vegetable fats, whole grain cereals, fish, meats, yeast and leguminous foods—peas, beans, and lentils are good sources of this vitamin.

Pantothenic acid is universally found in all animal cells and is necessary for proper health of tissues. It is believed to be used along with thiamine, riboflavin and niacin in aiding the body to make proper use of carbohydrates. It seems to affect growth and its lack in the diet will impair or harm the reproductive

system. It is not known what symptoms occur in man when it is not in the diet, but in fur animals the hair turns gray and in chicks there are incrustations about the eyes and corners of the mouth, as well as between the toes. Interestingly enough, it occurs in the same foods as most of the other B vitamins: liver, kidneys, yeast, milk, bran, whole-grained cereals, crude molasses. It was this vitamin that was advertized widely a few years ago as preventing gray hair; however, the following vitamin has been proven more influential in this respect in man.

p-Aminobenzoic acid affects growth and color of hair. It is found in nearly all plant and animal life.

Inositol is another B complex family member about which not much is known as to its effects on man, but in mice and rats there is a loss of fur and a severe dermatitis appears. In dogs, it increases peristalsis (movement in the digestive tract and in the bowel), and prevents fatty livers from containing large amounts of cholesterol. It occurs as a food source in fruits—especially citrus fruits, cereals, liver, kidneys, heart and other meats.

There are many more B complex vitamins which have recently been discovered, but scientists are working out their importance and effect on man. Since most of these members of the B family occur in the same foods, if you include in your diet such items as liver, kidneys, muscular meats, fish, green leafy vegetables, whole-grained cereals, enriched bread and cereals, milk, cheddar cheese, yeasts and eggs, you will be assured an adequate intake of these vitamins without resorting to proprietary compounds or pills.

You are probably still shuddering over de Joinville's lurid description of scurvy, so there is no need

to dwell further on this dread disease due to the lack of *vitamin C*. The absence of scurvy, however, by no means signifies that you are well supplied with the vitamin, for scurvy is the result of extreme deficiency. It is believed to have many functions; for example: there is evidence that it is essential for the normal formation of bone and teeth, working in cooperation with vitamin D. It is also required for the health of the cells lining the circulatory system and maintaining capillary resistance. It acts upon certain cementing substances in the matrices of bone, cartilage and dentin in teeth, and in capillary walls. It is also necessary for proper tissue respiration, glandular functions and defense of the cells of the above structures against bacterial attacks.

A mild deficiency of vitamin C is connected with weakness, restlessness, poor resistance to infections, digestive disturbance, headaches, defective teeth, retarded growth, lesions in the endothelial tissues, such as the lining of the circulatory system, and a tenderness felt in the joints. Extreme deficiency signifying scurvy is manifested in capillary hemorrhages, swollen joints due to periosteal hemorrhages as well as swollen, bleeding gums, loose teeth, fragile bones, possibly anemia, and respiratory and intestinal infections.

An abundance of fresh fruits and green vegetable salads will assure a good suply of vitamin C in the diet. Much of the potency of foods containing vitamin C is lost in storage; drying; cooking in open kettles or exposing the vegetable or fruit to air; and breaking up the pulp and letting it stand for some time, so that oxidation of the vitamin occurs and the valued vitamin C is lost. Preparation of foods for meals should be done at the last minute before eating them. Com-

mercially canned foods retain a great amount of potency. Fresh, canned or bottled citrus fruits and tomato juice are convenient and economical food sources, canned citrus fruit being the cheapest for the amount of vitamin C present.

Good sources of vitamin C are, fortunately, low in calories, which may be comforting news to those bent on reducing. Foods containing the highest amount of vitamin C are: black currants, broccoli, Brussels sprouts, cabbage (the green leaves), dandelion, mustard and turnip greens, kale, kohlrabi, red and green sweet peppers, parsley, spinach, sprouted grains, strawberries, and watercress. Other food sources which are fair ones with which to supplement the diet are asparagus (green), cantaloupe, chard, citrus fruits, green lima beans, fresh green peas, fresh pineapple.

Since any over-intake of this vitamin is readily excreted by the body, there is no chance for any ill effects from any possible over consumption. In fact, as first stated, a diet including plenty of fresh fruits and green vegetables will adequately fill normal needs without any recourse to pills or tablets of vitamin C and will give you the added assurance of other vitamins and minerals being taken in, of which will help promote good health.

It is wonderful to think that the sun, 93 million miles away, is the source of all things living on earth —the trees, the flowers, the birds, the animals and us human beings. Without the sun the earth would be a cold and lifeless planet. It is still worshipped by many peoples as the giver of life and of health, yet not until a few years ago did it become known that the sun is the creator of Vitamin D, the "sunshine" vitamin so plentiful in cod liver and haliver oil and so

necessary for the prevention of rickets, the commonest of nutritional diseases amongst children of the temperate zone.

Rickets may appear as early as the third month after birth. It is characterized by constipation, irritability, restlessness and loss of sleep in its earlier stages. The muscles of the legs, arms and abdominal region become lax. Later the ribs develop knobs or beads and "pigeon" breast develops. The head acquires a peculiar square shape and the long bones become bowed and curvatures of the spine develop. The sufferers from rickets are usually very sensitive to touch, they may have a slight fever and perspire profusely. They are stunted in their growth and are susceptible to respiratory infections which may lead to death. After the third year rickets are no longer active in form, although still active in effect.

While rickets is a disease of childhood, there is a similar disease known as osteomalacia (softening of the bones) which may develop in adults. It exists almost entirely among Mohammedan women in the East and is the result of the secluded life they practise. It is characterized by softening of the bone, hysteria and extreme muscular pain. It is soon curbed by the administration of cod liver oil.

In addition to the prevention of rickets, Vitamin D has an important part in tooth formation and in the maintenance of normal, healthy teeth. However, the cause of dental caries is in all reality still unknown and there is little evidence to prove that Vitamin D insures normal tooth formation or will actually prevent decay. All that can be said is that it is apparently a favorable influence towards normal teeth.

Vitamin D is also a potent factor in calcium and

phosphorus metabolism and is therefore needed even after full growth is attained and the danger of rickets is long passed.

Good natural sources of vitamin D are found in fish liver oils, egg-yolks and in liver; irradiated milk and other fortified foods containing fish oil concentrates are also good sources. The action of sunlight which affects the cholesterol present in the skin activates this provitamin into vitamin D.

Vitamin D is found in two distinct forms: ergosterol, which is the precursor or provitamin in vegetable organisms and when activated by irradiation becomes vitamin D_2; and 7-dehydrocholesterol, which is the provitamin in animal organisms and which upon activation by irradiation, becomes vitamin D_3. As this latter is found in fish liver oils it is sometimes called "natural vitamin D" and is one and one half times more efficient than the D_2 or vegetable-derived provitamin. There are several other provitamins, but most of these are toxic in effect.

Because this vitamin can induce more calcium deposits on bones than is normal and bring about tissue degeneration if taken excessively, you should not take concentrated forms of this vitamin without directions from your physician. Irradiated ergosterol is produced for medicinal purposes from yeast and is known to the medical profession as "viosterol"—"bottled sunshine." It is used for rickets as well as for pregnant and nursing mothers and babies and young children, all of whom need additional amounts of vitamin D, but *only upon specific prescription by your doctor as to amount and in what form to be taken.*

Normally a short sun bath, or a brisk walk each day in the open air, and proper diet including eggs,

liver and milk will provide adequate amounts of this vitamin as well as yielding other valuable nutrients and worthwhile results in good health. The adult requires very little, though this little is extremely important since a deficiency affects the calcium metabolism harmfully and results in decalcification of the bones, eventually leading to brittleness and the condition called osteomalacia. Its valuable bone-building qualities are particularly important for children whose bones and teeth are growing and forming. If a child does not have enough vitamin D, plus vitamin C and the necessary minerals for bone structure, excessive cartilage formation sets in and the joints become enlarged. Dental caries result, in part, from vitamin D deficiency.

Vitamin D, when it occurs in fats or oils as in fish oils or egg yolk will not be affected by cooking; homogenization, pasteurization, or canning do not lower the potency within a food to any great extent.

Ten years ago scientists were greatly puzzled by the fact that experimental animals, who were apparently fed on a well-balanced diet and who were apparently healthy, failed to produce offspring. Finally H. M. Evans of the University of California solved the mystery—certain foods contained a special fertility factor which was named vitamin E. This factor, upon further study, was discovered to be a group of vitamins having the same physiological effect: in the female, that of causing "resorptive sterility" (absorption of the embryo) or habitual loss of the embryo which is overcome by the presence of vitamins E; and, in the male, that of permanently damaging the functioning of the seminiferous tissues. The term "anti-sterility" is not quite truthful; the

presence of *vitamins E* (*alpha-tocopherol, beta-tocopherol, and gamma-tocopherol*) aids normal functioning of reproductive tissues. Its presence is also effective in maintaining normal behavior of the neuromuscular system.

The exact action of this vitamin group is open to further study.

One need not worry unduly about the presence of this vitamin group in his diet as it occurs in the very foods which have been mentioned before as essential for good health. Excellent sources are vegetable oils found in plant materials such as whole-grained foods; seeds of the legumes, peas, beans, lentils; corn and cottonseed oils; and lettuce. There are also smaller amounts of the E vitamins in animal fats, as found in egg yolk, meats, and milk. This group of vitamins is quite stable to light and air, but readily destroyed by any change toward rancidity in associated fats and by ultra-violet light. The liver stores the E vitamins, and some is found in the heart and kidneys.

Biotin or vitamin H has been classified as one of the vitamin B complex. Little is known about the effect of this vitamin on human nutritional welfare, but clinical symptoms of its lack in the diet have resulted in great lassitude and sleepiness, muscle pains, distress in the region over the heart and stomach, and loss of appetite. The skin and mucous membranes take on an unusual, ashy pallor and the skin becomes increasingly drier. This vitamin seems to be manufactured by the bacteria in the colon in amounts large enough to make man independent of any food sources, but egg yolk, liver, kidney, yeast, milk and molasses contain biotin.

Vitamins K (K_1 *and* K_2), like biotin, are produced

by bacteria in the colon. Deficiency of this vitamin group produces hemorrhage due to sharp decrease of prothrombin in the blood which lengthens the blood-clotting time. As vitamins K do affect blood-clotting, these have been called "anti-hemorrhagic" and have been used to offset undue loss of blood in patients undergoing operations. It is very effective during child-birth as it prevents hemorrhage in the mother and intercranial and other hemorrhages in the new-born infant. A generally good diet, including green leafy vegetables such as spinach, cauliflower, cabbage, kale, as well as tomatoes and vegetable oils will provide for normal human needs.

Citrin or vitamin P is so-called because it is found in citrus fruits, particularly in lemon peel. This vitamin affects the permeability of blood-vessels and any deficiency of it in the diet results in the lowering of capillary resistance shown as skin hemorrhages, and in the ready seepage of blood through vascular tissues or blood-vessels. The clinical symptoms look very much like the scurvy we described under vitamin C; but in this case, the application of vitamin C does not change the condition and citrin, or vitamin P, is needed to clear up the scurvy-like hemorrhagic conditions of the skin. Citrin is also useful in clearing up inflamed and sore gums, the condition which is called gingivitis. Besides citrus fruits, citrin is found in paprika juice and in many other plant materials containing deep yellow coloring.

There are several other vitamins which, as yet, have been non-identified so far as human nutrition is concerned. This field of research is constantly growing. We have discussed here those which are now known to be important for good health and welfare.

Our brief review of the foods in which they are to be found should convince you that a good general diet will assure their being present—the known vitamins as well as the unknown.

You probably feel by this time that you'll never be able to eat a mouthful of food without thinking of vitamins and wondering whether you are developing some of the various dreadful symptoms we've just described—perhaps you feel that you have them this very minute. In reality, vitamins *per se* should not be taken *too* seriously by the average person. Living in an era when fresh food is abundant all year round and scientific methods of preserving retain the full value of the various components of foods, you are sure of getting all the vitamins you need if you eat a well-balanced diet containing plenty of fresh, very colorful vegetables and fruits, meat, fish, eggs and milk. Besides, the vitamins would be of no avail without energy-producing foods and their component minerals as well as tissue-building proteins. And no food is going to do much good if you don't see to it that your whole alimentary canal, from your month to your colon, is in good condition.

And by no means take it upon yourself to take vitamins in a concentrated form—not even through a so-called sun lamp. If you feel tired, have no appetite or can't sleep, or have more serious symptoms, consult your physician and not your well-meaning neighbor or friend. It takes years of study and practice to diagnose diseases or functional disturbances, and it is more than likely that the lack of vitamins—providing your diet is correct—is not the source of your trouble.

CHAPTER X

FOOD AND THE ACID-ALKALI BALANCE OF THE BODY

In addition to their caloric, vitamin and mineral value which we have just discussed, foods exert an acid, alkaline or neutral effect in the body. But before we consider this aspect of nutrition, we should pause to explain what acid and alkaline signify with reference to the tissues of the body. Probably no phase of nutrition or bodily functioning is so misunderstood, thanks to the advertising of "alkaline" foods, cathartics, saline beverages and a host of remedies for "colds" and other common illnesses. We are commanded to "alkalize our systems", prevent colds by alkalizing, we are threatened with acidity if we don't change our brand of cigarettes and fair promises of beauty, vitality, popularity, husbands and phenomenal—really miraculous—business careers are promised us if we but alkalize. Small wonder we have become "acid-minded" and, having lost faith in the wonderful powers nature has given our bodies for maintaining the proper reaction, frantically seize the nearest alkalizer! Small wonder local conditions such as a "sour" stomach are mistaken for a systemic acidosis and persons have made themselves seriously ill by over-alkalizing.

One of the most remarkable powers nature has given us is the power to constantly maintain the

composition of the fluids which surround the cells of our bodies. Small chemical changes, too small for our detection, are continuously occurring and being adjusted as a part of the ordinary activity of the body. When such changes exceed certain limits, a state of disordered metabolism is set up. And this is important to remember—the changes need not be pathological, but they are always indications of the body's effort to control the situation.

Now this constant state which the body strives to maintain is a state in which there is a very fine balance between the acid and alkali of the fluids, both of the tissues and of the blood. It must be maintained in order that the living organism may carry out its various functions properly—in fact, in order that it may live.

The regulation of the balance between acid and alkali of the tissue fluids is probably one of the most delicately adjusted of the regulating processes. Yet strangely enough, until recently very little attention was given to the question of acidity or alkalinity with reference to the body fluids. Now, however, with our greater knowledge of chemistry of the body, the importance of maintaining or restoring the acid-base balance in the cure of disease is not only one of the principal objects of physiological and clinical research, but is constantly uppermost in the minds of the practicing physician and surgeon.

The ratio of acid to alkali or base is not equal—there is a slight, very slight excess of alkali. Even a moderate departure from normal may lead to serious interference with the various activities of the tissues. On the other hand, alterations in the metabolism of

the tissues themselves have a profound influence on the balance and many of the phenomena in disease are manifestations of the body's activity in preventing the reactions of its fluids. In other words, a disorder such as constipation may lead to an upset in the acid-base balance and its grave consequences, or an upset in the acid-base balance, due to dietary or other causes, may lead to constipation.

The slight excess of base or alkali over acid is known as the alkaline reserve. The alkaline reserve represents the amount of base or alkali that is available of an additional acid that may be formed or absorbed by the system. In other words, the alkaline reserve of the blood is the amount of alkali available for the transport of acid.

If, because of diet, disease or any other reason, there is an excess of alkali which the blood has not disposed of, a state of alkalosis results, that is, a state in which there is more alkali than normal. (The reaction of the blood is taken as an index of the reaction of the body in general.) When, for like reasons, the amount of alkali is less than normal, a state of acidosis results.

It is wrong to consider acidosis and alkalosis as disease entities. They are only signs or symptoms of disease, like a headache or fever. Both conditions are manifestations of the body's reactions to pathological conditions or processes. It is, therefore, of supreme importance to discover the cause of the upset and treat the cause. Masking an acid condition with so-called alkalizers or treating only the symptoms is dangerous. This is particularly true in the case of the growing child, as disturbances are more frequently encountered in childhood and the ability to overcome the

upset and establish a normal equilibrium is less perfectly developed.

To be sure, it is logical to suppose that the administration of alkali will relieve acidosis—which is the case. Under no circumstances, however, can we say such administration will cure a diseased condition—it cannot. All that can be claimed is that the acid-base balance will generally be restored to normal and that as a result the body will be able to carry on its functions with renewed vigor, thereby combating the disease with more or less success. An alkali, then is merely supportive.

Now as the tissues of the body are burned to form heat and energy, acids are formed such as carbonic and lactic acids, which are received by the blood, as well as alkalies such as sodium, potassium, calcium and magnesium. The diet, too, as we pointed out, contains varying amounts of acid and alkali. The digestive juices dispose of some of the acid (in gastric juice) and some alkali (in the bile and pancreatic juice). But the net result of catabolism, that part of metabolism concerned with the breakdown or conversion of tissue into heat and energy, is the production in the body of a great excess of acid over base.

While it is true that life can be sustained with a blood and tissue reaction more alkaline than normal, death ensues at once if the system becomes even slightly more acid than normal. In this respect the term acidosis is misleading, to say the least. It refers only to a *lesser amount of alkali:* hypo-alkalinity or alkalemia is by far more accurate, but it is not extensively used.

It is quite obvious then, that there must be some

mechanism or mechanisms for dealing with the excess formation of the acid products of metabolism, as well as excess alkali. Furthermore, provisions for the disposal of acid must be greater than the arrangements for combating an excess of alkali. This is because the products of normal metabolism—carbonic, lactic and phosphoric acids—can be used to neutralize excess alkali.

Unfortunately, excess acid cannot be similarly dealt with by the utilization of base, since practically none of the products of metabolism is alkaline in nature. Accordingly, a breakdown in the defenses against an excess of acid should be more serious than a collapse of those against an excess of alkalis. This is indeed the case. As we have said, the former is an acute condition which may cause rapid death; the latter, on the other hand, seldom endangers life.

The manner in which the acid-base balance is maintained is an extremely interesting subject as well as one of supreme importance. It is accomplished by chemical, physiological and physical means. Broadly speaking, it is accomplished by three methods—by the buffer action of the blood and tissues, by respiration and by excretion. The whole mechanism, however, is so delicately adjusted and the various processes are so interdependent, that it is necessary to take into account all defensive reactions whenever an instance of a disturbance of the acid-base equilibrium comes under consideration.

A buffer is a substance which tends to make the change in the reaction of the fluid less than it would normally be when acids or alkalies are added. The buffer salts of the body are the bicarbonate, carbonic

acid, phosphates and proteins. Proteins have both acid and alkali properties which enable them to perform a dual function: one group combines with acid, the other with alkali.

Carbonic acid, unlike other acids of metabolism, is not neutralized immediately after formation and is found in appreciable amounts in the blood. With sodium bicarbonate, free carbonic acid forms an important buffer and it is the ratio of it to bicarbonate which regulates the activity of the respiratory center and the functioning of the lungs: an increase in free carbon dioxide stimulates the lungs to greater activity. The result is that extra carbon dioxide is given off through the lungs until the ratio is normal. Inorganic phosphates are present in the blood in two forms—alkali and acid salt. These two salts are powerful buffers and act similarly to bicarbonate and can easily and readily be excreted by the kidneys.

The buffer system of the blood, even with the help of the lungs, would frequently be overwhelmed if the defense against acid accumulation ended there. Fortunately, whenever this system is overtaxed by acid, the body rids itself of the excess acid by way of the kidneys, the sweat glands and the alimentary canal, the kidneys being the most important for this purpose.

The intestines play an important rôle in the excretion of the minerals, especially calcium and phosphorus. It has not been established yet, however, whether or not they exert any other protective action in the prevention of an excess of acid or alkali. We all know, however, often to our sorrow, that in conditions in which there is a disturbance of the acid-base equilibrium, the functioning of the intestines is disturbed

with a resulting indigestion, constipation or some other disorder; and, on the other hand, a disturbance in the regular functioning of the intestine may be accompanied—and often is—with an upset in the acid-base balance.

It should not be thought that variations in the acid-base balance are all pathological. On the contrary, there are constantly occurring slight variations which are purely physiological and normal. As the healthy body is capable of adjusting these variations and restoring the balance, there are no pathological effects.

The intake of food, without reference to their acid or alkaline reaction in the body, affects the acid-base balance. About one hour after breakfast there is a rise in the bicarbonate of the blood which is the result of the loss of chlorine secreted in the gastric juice. At the same time, the urine is more alkaline. This is known as the "alkaline tide". As the food passes into the intestines and the reabsorption of the chlorine of the gastric juice is taking place, the balance is gradually restored. The alkaline tide is not so marked and may even be absent after meals taken later in the day, since it is washed by the effects of previous meals and the acids produced by muscular exercise.

In health the starches, sugars and fats are completely burned to carbon dioxide and water which are removed so quickly that no disturbance of the acid-base balance is apparent. The oxidation of proteins, however, leads to the fermentation of sulphates, so that a high protein diet has an acid effect. The amount of minerals, whether acid or alkaline in nature, influences the acid-base balance in a corresponding direc-

tion, but the excretory system is usually capable of preventing any manifest changes.

When our muscles contract and expand, lactic acid is produced. However, since a slight increase in breathing is sufficient to remove the extra carbon dioxide, formed from a part of the lactic acid, there is no obvious change in the acid-base equilibrium. This is not the case, however, if the muscular exercise is of such a vigorous nature that enough oxygen cannot be taken in to complete the oxidation of the lactic acid. Under such circumstances the bicarbonate of the blood is reduced and breathing is increased. If this is not sufficient to maintain the normal ratio between acid and alkali, the urine shows an increase in acidity and in ammonia.

The application of heat, such as a hot bath, leads to an excessive pulmonary ventilation or breathing with a consequent washing out of the free carbon dioxide and the production of alkalosis. This is just what happens when you climb a high mountain and why when you brave alpine heights you feel nauseated and vomit.

All abnormal or pathological changes in the acid-base balance are the results of an impaired functioning or overtaxing of one or more of the protective mechanisms which we have described. There are many factors responsible for such conditions. Faulty digestion (systemic acidosis is not to be confused with sour stomach), disturbed excretion, dehydration, poor respiration, ingestion of acid foods, circulatory disturbances and many other disorders may contribute to the production of an acidosis. Indeed, it is not surprising that acidosis is a common pathological state and that

enterprising commercial concerns have been capitalizing it.

The signs and symptoms depend upon the nature of the acidosis. In the gaseous type, which is rare, breathing is slow because the respiratory center is depressed and therefore requires more carbon dioxide to stimulate it. The sufferer is usually drowsy or comatose.

Of the commoner, non-gaseous type, diabetic acidosis presents the classical picture. The most distinctive symptom is "air-hunger". In severe cases breathing, that is pulmonary ventilation is greatly increased, but the increase in rate is not so marked as the increase in depth of breathing. Breathing is painless and noisy and lips are cherry-red. This is, of course, an extreme case. There are many signs and symptoms which are common to all acidotic conditions regardless of the underlying cause. Some of the earlier symptoms—and those which most of us have experienced at some time or other—are an abnormal fatigue and feeling of general lassitude, lack of appetite, breathlessness, gastro-acidity, nausea, vomiting, headache, aching in the muscles, sleepiness, a flushed face and a sweet, fruity odor of the breath.

In severe cases there is a stupor or coma. Fever is frequently present and the condition, if neglected, may present such toxicity that it resembles typhoid. Often there is considerable tenderness in the abdominal region, even suggesting appendicitis.

In all cases of acidosis, of course, alkali in some form is prescribed in order to restore the normal acid-alkali ratio. However, in the usual methods of treating hyperacidity of the gastro-intestinal tract and acidosis, the "cure" is sometimes worse than the dis-

ease. This is frequently the case when large doses of a single alkali are employed. Many authorities have drawn attention to the fact that there is a danger of setting up an imbalance among the various alkalies of the body, with the possibility of the production of an alkalosis from this procedure. And we have pointed out—this is of such importance that it cannot be repeated too often—that the alkali treatment does not cure the underlying cause of the acidotic condition, it merely relieves it, and by restoring the acid-base balance, helps the body in its fight against the disease or condition which has tended to upset the balance, as well as enabling the body to resist additional disease.

Let us take as an example, that "uncomfortable nuisance", the so-called "common cold", for we have all suffered from them—at least two good, hard common colds are the average common lot yearly of everyone in America. But, of course, it shouldn't be! There is still much dispute about the direct and underlying causes of the cold. However, research and experimentation of the past twenty years have proved quite conclusively that a "filtrable virus" is the direct cause. In other words, a cold is caused by organisms too small to be seen with the aid of a microscope and which will pass through a clay filter so fine that other microorganisms are held back.

This filtrable virus, however, is only the *direct* cause of a cold. In many instances it is well known that a cold does not begin with the respiratory tract. For a week or two one might suffer with malaise, unusual loss of sleep associated with an usual amount of dreaming, or gastro-intestinal disturbances of vari-

ous kinds — indigestion, constipation, nervousness. And throughout the time there will be no signs of respiratory trouble.

The causes which interfere with the normal functioning of the respiratory tract may be classified as local conditions, such as adenoids or enlarged tonsils; external or active influences as sudden changes in temperature, drafts, dust, etc.; and internal influences including the general state of health.

The internal influences are those which cause a disturbance of the quality and quantity of the blood supply to the upper respiratory tract. Among these are acidosis, imperfect metabolism, a diet deficient in vitamins or otherwise poorly balanced, a sudden chilling, intestinal putrefaction with a possible absorption into the blood stream of the toxins from the intestinal tract, fatigue, exhaustion and starvation. All of these lower the natural immunity of the body to bacteria and virus.

With too much rich food, especially during the week-ends and holidays, we overload our digestive organs with food material that cannot be burned up. The resulting toxic condition of the blood or disturbance of the acid-alkali balance, hinders the nourishment of (according to some authorities, directly irritates) the mucous membranes of the respiratory tract and the bacteria multiply in the weakened membrane, resulting in colds, sinusitis, tonsillitis, bronchitis, etc. On the other hand, a cold or any other ailment, can produce an upset in the acid-base balance, and obviously the cure of that particular ailment can be hastened by restoring and maintaining the proper ratio between acid and alkali.

The most natural way, and therefore the simplest and safest way to keep the proper balance is via the alimentary tract and the diet. When food is normally digested, the bowels regularly emptied of waste matter and the diet well balanced, there is little danger of an acidotic condition arising in the average person. Some foods, we pointed out, have an alkaline effect in the body, and others an acidic effect. The taste of the food or its acidity before taken into the body, is no indication of its effect after it is consumed. For example, few of us can drink plain lemon juice without making a wry face and chemical tests confirm the verdict of our tongues that it is highly acid, yet generally speaking its effect in the body is alkaline.

Foods that are rich in proteins tend to have an acid effect in the body because when they are oxidized or "burned", many of the resulting "end porducts" are acidic such as uric acid, sulphuric acid and phosphoric acid. Under normal conditions these acids are neutralized by being balanced with alkaline material to form neutral salts which are eliminated by the kidneys. Among the foods that produce acid are meat, eggs, peanuts, walnuts, crackers, bread and oatmeal.

Broadly speaking, fruits and vegetables exert an alkaline effect. This is because they contain salts of alkaline metals such as calcium, magnesium, potassium and sodium. The acid parts of the salts, such as the acid of the lemon which we mentioned before, are burned in the body to carbonic acid which is easily expelled while breathing. Thus the alkaline metals are left behind ready for neutralizing the acid products from the foods rich in protein. The proteins, you will recall, along with bicarbonates and phosphates act as

buffers to maintain the normal faintly alkaline reaction of the blood and tissues.

In some fruits, such as cranberries, plums and prunes, there are certain organic acids which are not burned in the body. In such cases, the effect is acid.

In planning your diet with reference to the acid and alkaline effect of the various foods, remember this—the excess of alkali over acid is very slight and there is just as much danger in "over-alkalizing" your system through foods as through drugs. "Acid" is as necessary for normal health as "alkali" is. Moreover, many of our foods most valuable in other respects—in their vitamin, caloric or mineral content are acid in effect.

Probably the best rule to follow if you are in average health and lead a fairly regular life, is to eat almost as much acid producing foods as alkaline producing, and to eat a wide variety. That this is necessary can be easily proved by citing the action of that glorified vegetable—spinach—when it enters the body. Spinach, like rhubarb, cranberries, gooseberries, chard and beet leaves contain a large amount of oxalic acid. This acid is but poorly acidized in the body and prevents the utilization of an equal amount of calcium. Therefore, when you indulge (or martyr yourself) in spinach, be sure to maintain a high calcium balance by eating liberal quantities of foods rich in calcium, such as beans, eggs or milk.

CHAPTER XI

ALLERGY

Not long ago I met a friend of mine who had recently moved to the suburbs, and, like all suburbanites, he is very proud of his flower garden. So, of course, the first question I asked him was, "How are the roses getting along?" "Oh, just fine," he replied and his chest expanded just a little. Then suddenly he frowned. "But that neighbor of mine! The other day I called him over to see the roses—you really should see them —and he was positively insulting. He grew popeyed and jumped back, started to grope wildly for his handkerchief and actually pretended to sneeze. Huh! Guess he was jealous. Anyhow, I fixed him. Had me over to dinner last night. We had some of his strawberries and I just pushed back my dish and told him I couldn't eat strawberries. That's a fact—I never could —they give me hives and I stay awake all night scratching. They're worse than mosquitoes."

I sympathized the best I could, while endeavoring to suppress my smiles. For both were suffering from the very same trouble, in spite of the difference in reactions. They were suffering from a condition, probably as old as the world, but very young from the standpoint of medical discovery, a condition which is known to the doctor as "allergy" and which he describes as "an altered reactivity of the tissues of the

body to foreign substances." In every day language allergy is nothing but the hypersensitivity of the body to outside influences; and these influences may be anything with which we come in contact—food, clothing, heat, cold—even polite conversation. The symptoms are probably a manifestation of the body's attempt to defend itself against these influences—a very futile and imperfect attempt.

It is possible for the entire population to be allergic, for the condition has little to do with the substance itself, but rather with the condition of one's body. You yourself probably can't stand shovelling coal, although thousands of men shovel coal for a livelihood. You actually get sick when you have to tend the furnace, as your family well knows, and so they good humoredly stop your heroic efforts to do your part, in spite of your protests. Secretly, of course, you are mighty glad you don't have to shovel coal, and really quite proud of your affliction, for no one else of your acquaintance has it. Yet probably only ten per cent of the population suffer from frank allergy. One well known authority, however, made a study of allergic manifestations in a small community, and found that about 50 to 60 per cent showed that they were afflicted with allergy at some time or other.

Allergic reactions have many ways of expressing themselves, depending upon the nature of the external, physical causes, the family history of any sensitivity, and the location of the reaction in the body such as eyes, nose, skin, digestive tract. There are also emotional causing factors which give rise to allergic mani-

festations, perhaps with or perhaps without accompanying physical agents.

The physical agents of these reactions are called "allergens." They are usually protein substances like pollen, hair or fur, skin scruffings such as danders, egg, secretions of bacteria, or serums which are foreign to the proteins of the specific animal or person. Occasionally fats and sugars produce an allergic reaction, but the presence of a foreign protein seems to be a universally accepted cause.

Each kind of living being such as humans, cats, dogs, chickens and all other animals, has a characteristic protein structure in its tissues peculiar to the species, and any mixture of, or contact with, a foreign protein substance will cause irritation, or, more seriously, shock which can be fatal. This sensitivity in man is called *allergy;* in animals it is called *anaphylaxis.*

Allergic reactions may be inherited or acquired. Reactions in either class may be caused by one or several irritants, or allergens, resulting in itching skin, hay fever, asthma, headache, eczema, urticaria, diarrhea, colitis, peptic ulcers, kidney trouble, or general malaise. Inherited sensitivity (also called familial or atopic allergy) affects about 10 per cent of the population, whereas about 30 to 40 per cent suffer from acquired allergy.

Should allergic people marry and have children? Familial or inherited allergy is not conveyed by the blood stream of the mother, but is found in the germ plasm itself and thus passed on to the children by either parent or both, whichever one has this form of allergy. Such a sensitivity to allergens in the germ

plasm passes on to the child a predisposition to manufacture antibodies or reagins against a given irritant or allergen, upon enough or favorable contact with the allergen to produce a reaction. The stronger the family history of allergy, the more likely an early onset of some allergic reaction can be expected in a child who, however, may show different reactions or sites of reaction from those of his parents.

If parents who have some familial (or atopic) kind of allergy watch carefully for any signs of allergic reaction in their offspring, they can quickly refer the child to a doctor or a specialist in this field of medicine for gradual desensitization. Inherited cases can be identified by the history of some family predecessor with an allergy and by a personal history of allergic reactions which may be the same or different from those of one's allergic predecessors. There are certain cell structures in the blood, called eosinophils which also help identify the allergy. These eosinophils, because of the irritation of the mucous membrane, seep or "weep" through the weakened membrane and thus are found in the sputum or nasal secretions. Positive skin or eye tests and a typical response to epinephrine, or adrenalin (the constriction of swollen nasal and bronchial mucous membranes), likewise help the doctor to put his finger on the allergy.

Most of the familial or atopic allergy cases seem to show symptoms of reaction through bronchial asthma, hay fever, eczema, allergic rhinitis, migraine, some cases of urticaria, atopic dermatitis, and angioneurotic edema (swelling of vessels and nerves). The very fact that most of these cases come under the familial group has had particular significance to those

physicians interested in the effects of emotional upsets on these cases.

Later we shall talk more about the emotional factors, but now let us get on with the physical causes of inherited allergies.

The allergens causing the distressing symptoms we mentioned above can come from outside the patient or from within the patient. The list of those coming from outside the patient would be too lengthy for this chapter, so here are the irritants or allergens as to groups of items that can be guilty:

Inhalants: pollens, fungi, animal danders, cosmetics, house dust, occupational dusts (flour, chemicals), etc.
Contactants: clothing, cosmetics, chemicals, drugs, etc.
Ingestants: egg, milk, cereals, fruits and vegetables, drugs, etc.
Injectants: serum, insect bites, biologic products such as insulin, etc.
Physical Agents: sun, heat, cold, effort.

Agents acting from within are:

Infestants: intestinal parasites.
Infectants: bacteria, fungi.

As you can see, most of the allergic substances to which the inherently sensitized person reacts are generally those substances to which one is constantly exposed. On the other hand, the acquired type of allergy which we shall discuss a little later, is brought about by unusually contacted or uncommon substances.

Obviously, allergen inhalants bring about respiratory and eyelid reactions such as itching, weeping eyes with swelling of the mucous lining of the nose and inflammations of the inside of the eyelids, and bronchial asthma. The most common allergen is pol-

len which affects the nose and eyes, causing clogged sinuses, sneezing, itching and watering of the eyes and nose—a most distressing state, called hay fever. In affecting the lungs, a bronchial asthma is caused.

These reactions may occur several times a year; that is, each time an irritating pollen comes out. In studying the patient's reactions over several years, the observer will notice that these attacks recur at the same times each year which will further indicate just what may be causing the distress. Charts have been made showing what common irritating pollens are out in various parts of the country during each season, and by comparing the patient's record of attacks with these charts, the doctor can fairly well narrow the varieties of pollens. It may be one pollen, it may be several, but careful check of dates, what is growing where the patient lives and works, and in what quantities it occurs, if wind borne, will locate the villainous offender. Windy days that are clear are likely to be the allergic person's most miserably spent ones; and, night time seems to be more distressing than daytime.

Contactants cause some forms of skin eruption or dermatitis, but a large portion of dermatitis cases are due to ingestants, mainly disagreeing foods. Familial or atopic dermatitis includes infantile eczema, flexor eczema of children and allergic dermatitis of older children and adults sometimes called disseminated neurodermatitis. In adults, such a reaction is mainly due to emotional upsets which easily affect the high-strung person.

Atopic dermatitis looks "weepy" and upon being scratched turns into runny lesions which crust, then

the skin eventually gets rough and toughens. Infants usually have the dermatitis back of their ears, on face and neck, and on wrists. Flexor dermatitis in young children affects the tender parts around joints of arms and legs. The adult has an itching skin which, when scratched, erupts as described above. He becomes irritable, upset and cranky, cannot eat, sleep nor work and his whole outlook on life is distorted. In general, the doctor will recognize this kind of atopic dermatitis because of its distribution over the face, neck, back of ears. The lesion that is typical herein is due to a true allergen. A series of diagnostic skin tests or elimination tests, including one in diet, will show up the allergen causing the trouble in the same form as the dermatitis; reagins or antibodies will be present to combat or isolate the irritant. There is no history of contact as in acquired allergy.

Human as well as animal danders (dandruff or skin scruffings) are very active allergens both as inhalants and as contactants, producing allergic "colds," asthma, certain kinds of rhinitis, and dermatitis. Human danders often distress allergic infants and children, particularly if the mother has seborrheic dermatitis. Horse dander and horse serum sensitivity seem to be linked, which is important for the physician to know when administering serums or vaccines that might be from horses. The reverse, however, is not always true. Cat dander is important as an allergen as certain toys are stuffed with cat hair, or the fur is used for trimming, and in many homes there are pet cats. Dogs give off a kind of dandruff, too, which is an irritant. Goat dandruff may be found in certain materials such as rugs, blankets, cushions, mohair and some so-called

camel's hair fabrics. Rabbit hair is found in toys, felt goods—hats, slippers, in furs, rabbit wool yarns and yard-goods. Sheep wool, too, can be irritatingly present in clothing made of this fiber, as well as blankets, rugs and upholstery. Feathers, especially old feathers, also seem irritating and some obliging hotels and, certainly, hospitals provide oil silk coverings for pillows to prevent contact or inhalation.

Among cosmetic preparations, orris root seems to be the biggest offender of the inherently sensitive person. It is a very potent allergen and is found in most cosmetics, face powders, tooth powders and pastes. It is also in adhesive plaster—and is even used in the manufacture of gin! Some brands of cosmetics have been prepared just for unfortunate allergic persons.

House dust is a very active irritant to the nasal passages and lungs. The person who is allergic to this inhalant must live in rooms stripped of any dust-catching draperies; spreads, blankets, rugs and other furnishings must be very washable and kept clean. Windows and doors must be sealed, while a special filter of outside air eliminates this constantly present allergen from entrance or the patient will suffer from a "dust" fever like hay fever, or from bronchial asthma.

Other inhalants and contactants known to be allergens are insecticides containing pyrethrum; some are purposely made for the allergic person with substitutes. Insect emanations of sandflies and other insects also can produce skin irritations and asthma.

Most foods known to be distressing to the digestive system include those containing a protein substance, but may include certain fats and sugars which affect

some people. Since food allergy exists from infancy to old age, this field is very important and child specialists have become very much aware of the importance which food allergy plays in selecting foods for babies and small children that will agree. Some single foods or combinations of foods produce dermatitis, and gastric upsets such as diarrhea, canker sores, ulcers and colitis. The greatest offenders are the protein foods such as milk, eggs, and cereals. Then come fish, nuts, spices, vegetables and fruits. The fact that there are many ways a person can react to a food allergy and that if actively allergic to one food, he may be mildly allergic to others complicates the problem of "putting the finger" on the upsetting foodstuff. Careful observation may ferret out the culprit, and aid the doctor in finding out what foods are allergens actively irritating the particular patient.

Serums such as horse serums (anti-tetanus and others) were mentioned as being allergen injectants to familial types of cases. Other substances coming under the class of injectants would include drugs and biologicals, such as insulin, pituitrin, liver extract, salvarsan, sulfa drugs, penicillin and all kinds of insect bites. The manifestations of allergy would be found in local and systemic reactions involving the respiratory tract, or a generalized urticaria, in addition to the wheals left by hypodermic injections or insect bites. Physical agents such as sunlight, heat and cold are manifested allergically as urticaria, angioneurotic edema, nasal and respiratory distress.

Fungi and bacteria can also produce an allergic condition in patients who have inherited certain types of sensitivity or, as in the acquired allergy cases, have

been exposed to conditions bringing such a sensitivity about. The tuberculin type of sensitivity, as well as infection of the nasal sinuses and bronchial tree, nasal allergy and bronchial asthma are induced by bacteria.

Reaction to fungi may be a familial allergy, but most reactions are due to an acquired allergy. Airborne as most fungi are, many affect the respiratory tract, but as contactants they get under the skin. In familial or inherent sensitivity to fungi, asthma and allergic rhinitis are the most frequent manifestations. In acquired allergy, fungi growths in the skin occur where the skin is protected and kept warm and damp —ringworm in the scalp or on other tender parts of the body, fungi infections of the web of fingers and toes (our old advertised acquaintance—athlete's foot comes in here), the moist parts under the arms and in the groin. Fungi in foods may be helpful or poisonous to the system: brewers and bakers yeasts are beneficial to most people, to some they react as allergens.

The acquired allergies are signalized by the fact that substances come in contact, or are taken into the body, and cause reactions locally at the point of entry or where the allergen is present in or on the body. Ingested foods or fungi cause acquired allergic reaction in many cases; injectants such as serums or drugs, bacteria (penicillin) can cause an acquired reaction too; contactants such as chemicals, metals, cosmetics, hair or wool fiber materials, or certain plants can also be guilty of the same reaction although contact with irritants must be recognized as either producing a toxic effect on the skin or as a true allergy.

Allergic dermatitis due to contact with poison ivy

or oak, rubber, copper, nickel and many other chemicals and metals are among some of the things that can give rise to this skin condition. The typical lesion is a vesicle, the irritant is usually an oil or is oil soluble, and there are no reagins or antibodies present at the body site. The condition will clear when the patient temporarily stops using the irritant as the dermatitis occurs only on the exposed surfaces of the skin, itching and forming lesions looking like watery little blisters, which, if allowed to go on will "weep," then form a crusty tough skin.

Obviously, in a contact allergy, either the patient has to stay away from or stop using the irritant; or, through protective covering such as gloves, masks, or special clothes, or applications of protective ointments and thorough showers upon leaving work, eliminate contact with the irritant. A physician can best advise how to combat such a dermatitis.

Now that we have discussed a few of the facts about allergy with regard to kinds, causes, reactions, and where and how these reactions manifest themselves in the body, you may want to know what a doctor can do to relieve these acutely distressing conditions.

Your own observations of what might be the irritating factor may solve the problem as to what to avoid. Note what you eat, what grows in the area in which you live and work, what times of the year symptoms arise, the kind of weather, what soaps, cosmetics and materials in your clothing at work or recreation used, what animals you contact. These facts reported faithfully to your doctor will go a long way toward solving the mystery. Many times the patient or observer can discover what is irritating; perhaps,

a long series of tests will be required before discovery is made.

Listed below are some of the points generally followed—whole or in part—by the doctor in seeking to get all the facts and symptoms in a case of allergy.

Patient's history: what is patient's chief complaint and what symptoms have been observed; patient's own idea as to cause; whether or not patient reacts to irritants such as tobacco smoke, tar, paint odors, etc.; what time of year do symptoms occur, or, when and where do symptoms seem worse; whether or not patient uses drugs and if he notices any symptoms shortly after the time taken; does heat or cold bring on symptoms; does epinephrine give any relief to nasal passages.

Social history: what does patient do during 24 hours of the day in terms of occupational and recreational activities that might include contact with animals, insecticides, cleaning materials, chemicals; furnishings in house or at place of work that might collect dust, animal hair and danders; what cosmetics, including soaps, powders, toothpowder or paste, perfumes used; where does one walk or play in terms of plants and animals contacted, and, exposure to sun, heat, cold.

Past medical history of patient: Any record of child or infant eczema, regular vomiting, gastric symptoms, bronchitis, repeated colds, asthma and headaches; what vaccines or sera have been injected and when.

Family history: any antecedent member of family have an allergy or do any of the children of the patient have allergic diseases.

Physical examination: a thorough general examina-

tion to determine presence of pulmonary tuberculosis, cardiac asthma, gland enlargements in chest and base of throat, or kidney disease.

Diagnostic or sensitization tests: Extracts of the possible irritants are injected and any reaction in the form of a wheal or local edema around the point of entry indicates the allergen causing trouble. Extracts may be hypodermically injected or scratched into the skin. Also, the patch test where a sample of material is taped to arm for 4 days, the irritant will show up as a wheal. Nasal test and ophthalmic test consist of the patient sniffing or having possible irritants sprayed in nose or on lining of lower eyelid which will cause a typical hay fever reaction upon application of the causative allergen.

Elimination tests including inhalants, contactants, injectants and ingestants will be given if the allergen is not discovered or known at first. The sufferer certainly must develop the virtues of patience and persistence during test periods; but only through such trials can relief ever be within reach. Honest and faithful adherence to the doctor's program no matter what well-meaning friends say is the only way. These tests may cover food restrictions aimed at finding the digestive culprit and can include diets that are wheat-free, milk-free, egg-free or free of all three items or such other items as seem causative of the symptoms. Your doctor can provide the texts and recipes necessary to carry these out showing the foods to eat, forbidden foods and ways to prepare meals that will keep up good health during the elimination test-period. Contact dermatitis will require elimination tests and then substitution of the irritating ma-

terial or protection from it. Atopic allergy treatment (familial or inherited allergy) may require desensitization pre-seasonally, co-seasonally, or annually, or through gradual exposure to the allergen so that a body toleration will be built up.

It is not our purpose here to discuss in detail what can be done; each case requires particular treatment and care under the supervision of a competent physician.

Several times, we have referred to emotional upsets as being the basis of allergic symptoms. Illnesses so brought about are called psychosomatic in origin as opposed to those originating in physical causes.

"As a man thinketh, so is he," is indeed applicable here, for as a person's emotional life is acutely upset, so his body reflects this condition. Everyone knows that when he becomes extremely angry, fearful or irritated his stomach becomes upset, he feels nauseated, may have diarrhea, and if the aggravation extends over a long time, can even develop a case of stomach ulcers and colitis.

The experienced physician, when he cannot discover a physical cause for allergic symptoms, searches diligently for just such an underlying cause, for if no physical factors can be found, he suspects an emotional factor at work.

One of the outstanding authorities in this field says that intellectual ideas of the patient are not the causative factors, but the emotions which have a very powerful effect upon the biological changes in our bodies. A child's longing for a parent, particularly the mother, along with its anxiety when left alone, are very deeply affecting since one's very own existence

as an infant or small child is dependent upon the parent. The basic fear of being rejected, unloved and helpless may still be present and operate even in adults emotionally.

The kinds of symptoms most often coming under an unclassified source of allergic reactions which are traceable to emotional insecurity are: vasomotor rhinitis, intrinsic asthma, some forms of urticaria, and hay fever, bronchial asthma and the asthma-eczema-prurigo syndrome in children.

Vasomotor rhinitis, a kind of perennial hay fever, has been regarded as purely an allergic problem, but its relation to sinusitis is important as emotional upset brings about vasomotor rhinitis which, in turn, leads to sinusitis.

Inner conflicts and attempts at their solution give rise to repression and produces irritation and dilation of the mucous membranes. This weakened or sensitized condition of the mucous membranes provides a ready field for irritants. When the emotional "storm" and repressions are eliminated, this mucous membrane weakness subsides and any inhaled irritants do not have an aggravating effect.

Intrinsic asthma cases usually have a predisposition toward asthmatic attacks due to sensitivity to heat and cold, bacteria, metabolic disturbances, and a high emotional instability or irritability. Where parents or surrounding persons upon which the patient depends are over-anxious or are insecure people themselves, and where the patient feels the need for attention, one will find that the patient's distress occurs when he feels insecure or wishes to "get back" at

these people by distressing them, in turn, through his asthmatic attacks.

In the asthma-eczema-prurigo syndrome, children having asthma, eczema and itching skin are largely those with abnormally overprotecting parents.

Urticaria is sometimes a form of psychosomatic reaction to being rejected by relatives and friends. Its outbreak mars the skin, yet, it reflects by the reverse way of expression the desire for admiration, to be beautiful, to have fine clothes in order to compensate or offset the longing for love of a parent or relatives.

Some cases of diarrhea, colitis and peptic ulcers are not due to foods or an organic disturbance in the alimentary tract, but due to an emotional strain. There is a direct action biologically upon digestive organs which produces these symptoms. Coincidental to this reaction is the fact that such a patient usually gains attention because of the required nursing, or, others show concern and interest in the patient's welfare and the patient's need for this expression of being thought of by others and paid attention to is gratified.

As one authority on this aspect of allergy states, longing for love, security and attention is only one factor in producing the symptoms. It may operate independently of other specific allergic sensitivities, or it may occur where other physically caused sensitivities are present. The more nervously high-strung the person is, the more likely that emotional strain and stress will have a biological reaction which apparently influences and complements allergic sensitivity.

Certainly the healthy way of living and thinking is the necessary ingredient to well-being. As to one's

emotional way of living, I am reminded of the advice of the popular song: "accentuate the positive, eliminate the negative." If you keep your entire system in good condition, your alimentary tract in good order, your skin clear and pliable, your respiratory organs in healthy condition and your mind and emotions balanced and harmonious, you are less likely to become allergic.

CHAPTER XII

THE ALIMENTARY CANAL

C-O-N-S-T-I-P-A-T-I-O-N. Look at the word and pronounce it to yourself. Slow and heavy and lumbering —probably no word in medical phraseology so aptly fits in sound and appearance all that it stands for—sluggishness, lassitude, dull wits, dull eyes, heavy head, muggy skin, lack of appetite, poor digestion, sleepy days and wakeful nights, moods of depression and discouragement, irritability . . . Constipation truly "spells misery", not only for its victim, but for those around him.

Literally, of course, constipation means a clogging of the intestines with waste matter which should be regularly and completely expelled. In order to comprehend the full significance of a failure on the part of the intestines to perform their function of evacuation properly, it is necessary to have a clear picture of the structure and functioning of the various organs which have to do with the digestion, absorption and elimination of food. So, in case you have forgotten the physiology which you so painstakingly studied at school, let us briefly review the lesson on the alimentary tract.

The alimentary tract or canal, you recall, is the name given the long labyrinth-like tube, beginning with the mouth and ending with the colon, which

transforms the food we eat into a form that can be absorbed into the blood stream and utilized by the tissues, and expels what cannot be used, along with other waste matter. Each part of the alimentary tract has its own peculiar structure and its own function or functions to perform. Nevertheless they are all so closely related to one another that if one part is out of order, the others are likely to be affected, particularly from a functional standpoint. If your stomach, for example, fails to do its part in the digestion of your dinner, you are likely to become constipated unless you correct the trouble; on the other hand, if you are suffering from constipation, it will be frequently reflected in poor digestion.

Mouth, Pharynx and Esophagus

When you convey a piece of food to your mouth, particularly if it is savory, you instinctively roll it about with your tongue and crunch or chew it with your teeth in order to get its full flavor and to swallow it with ease. Flavor, we have learned, is important for good digestion for it helps to increase the flow of digestive juices, just as the sight and smell of appetizing food do. By rolling the food about the mouth and chewing it, it is broken up into small particles with the aid of saliva and therefore reaches all the taste buds on the tongue so that you can delight in the delicious flavor of the morsel while at the same time the digestive juices are getting ready for their work.

Mastication has another function which many authorities consider more important than the two we have just cited: it directly aids digestion in two ways —first, by breaking the food into smaller bits, it

enables the various digestive fluids to do their work with greater ease since broken up they can penetrate the food more readily and, secondly, by mixing the food with saliva which is the first digestive fluid with which the food comes in contact. The saliva contains a digestive ferment or enzyme, ptyalin, which acts on starches, breaking them down into simple sugars.

To just what degree of fineness food should be masticated is a debatable question. A few decades ago thorough mastication to the point where the food and saliva formed a consistency of thin cream was all the rage. If you didn't "Fletcherize", as this type of chewing was called after its prime advocator, you were doomed to an early death, and even worse, might become a social outcast. However, Fletcher himself died rather prematurely in spite of his chewing and "Fletcherism" lost its prestige. But on the other hand, we have all experienced, at some time or other, the disagreeable effects of "bolting" our food and as we have described them in a previous chapter, there is no need to dwell upon them here. The best thing to do is to strike a happy medium between Fletcherism and bolting. In this way indigestion and consequent constipation due to bolting may be avoided as well as the boredom of Fletcherism which is only partly relieved by watching the faces of your table companions go through rabbit-like contortions!

After the food is swallowed it passes into the pharynx or throat and from there into the esophagus, a tube continuous with the pharynx, about eight inches long in a grown person. Wavelike contractions of this tube propel the food to the stomach where it enters the cardiac orifice of the stomach. This part of the

stomach is so named by reason of the fact that it is located near the heart, that is, slightly on the left side of the body, just below and back of the lower ribs.

Stomach

In the stomach the process of digestion is continued, a large part of the protein being broken down into a form suitable for absorption. The digestive action of the stomach is twofold—mechanical and chemical. The circular and longitudinal muscles of the stomach contract and relax with a rhythm-like motion. In this way the food mass is moved back and forth, from one end of the stomach to the other, so that it is all churned up and mixed thoroughly with gastric juice.

The digestive ferment or enzyme of the gastric juice is pepsin. It acts only on proteins or albuminous foods such as meat, fish or eggs. It is secreted by small glands all over walls of the stomach. As it acts only in an acid medium, the stomach glands also secrete hydrochloric acid for this purpose. The character of the gastric juice secreted in the different parts of the stomach varies considerably. This is especially true of its acid content. In the middle section, the secretion is rich in acid, while in the cardiac region and the pyloric end or part of the stomach which opens into the small intestine, the cells which appear to secrete the hydrochloric acid are few in number if they are present at all. Hence the juice secreted in these regions must be neutral, or according to some authorities, even slightly alkaline.

The muscular movements likewise vary considerably in the different parts of the stomach. The wavelike movements which cause the food to be mixed thor-

oughly with gastric juice begin in the middle portions and travel towards the pyloric end to the pylorus. Thus the food is pushed forward towards the pylorus and then back again as the muscles of the stomach constrict. In this way the food in this part of the stomach is thoroughly mixed with the gastric juice.

On the other hand, the food in the cardiac end of the stomach—where it first enters—is not moved by peristalsis or wavelike movements. Therefore it does not become as quickly mixed with gastric juice as in the lower region. Moreover, since the gastric juice secreted in this portion contains but a small amount of acid, if any, the food remains in the same neutral or slightly alkaline state that it was in when swallowed. It remains here for some time—a half hour to two or more hours—so that the ptyalin of the saliva may continue its work on the starches. This is contrary to the former belief that all salivary digestion was stopped by the acidity of the gastric juice as soon as it reached the stomach.

In the meantime the pouchlike portion of the stomach or fundus is slowly contracting upon the food mass and by degrees is moving it toward the pyloric region. As the food is digested the pylorus opens and lets it pass into the small intestine, and in the process the pylorus tends to open more and more frequently until finally it may open to allow food to pass which has not been acted upon by the gastric juice. However, x-ray examinations have shown that the pylorus opens only in the presence of acid in the intestine. Therefore it is probable that normally the food is allowed to pass into the intestine only when the protein is saturated with hydrochloric acid.

Just how long food remains in the stomach, and whether it will be completely emptied before the next meal, depends on several factors.

Health in general and of the stomach in particular are important factors. The mental and physical state at the time of eating also influences digestion. You will recall that we have previously stressed the need for relaxation and pleasant surroundings in order to insure good digestion. Under normal conditions, however, much depends upon the kind of meal eaten. Generally speaking a small meal or snack may disappear from the stomach in one to four hours, but if you adhere to the customary three meals a day, in spite of our pleadings to the contrary, a food meal may remain in the stomach for six or seven hours.

Under ordinary circumstances, if each type of food is eaten separately, the protein remains in the stomach longer than the starches and sugars, fats longer than protein and a mixture of protein and fat longer than either alone. This is probably due to the fact that fat has a tendency to retard the movements of the musculature of the stomach and the secretion of the acid gastric juice. However, fats that are emulsified or broken down into tiny globules pass on to the intestine more quickly than those in large masses. This is also true of the softer and more liquid fats.

In addition to its rôle in digestion, the acidity of the gastric juice has another all-important function. It partially disinfects the food mass. It has been proven that when, because of some abnormality, the hydrochloric acid of the gastric juice is decreased, bacteria may multiply rapidly in the stomach.

The acidity of the food mass or chyme as it is

called, when it leaves the stomach, also influences the flow of pancreatic juice, which is one of the digestive juices which acts upon food in the small intestine.

To sum up the functions of the stomach: it acts as a storehouse for large amounts of food—a whole meal, for example—and then passes it on partially digested, in small quantities to the small intestine. It serves as a place for the continuation of starch digestion by saliva which was begun in the mouth. It starts the digestion of proteins and possibly of fats by breaking them into smaller particles. And lastly it acts as a disinfectant through the germicidal properties of the hydrochloric acid of the gastric juice.

Small Intestine

The term "small intestine" is somewhat misleading, for in an adult it is all of twenty feet long. "Small" refers only to its diameter which is considerably smaller than that of the large intestine. It is in reality one continuous tube, but is usually medically considered as being divided into three sections. The first part or that part connected to the stomach is almost a foot long and for this reason is called the *duodenum*, which means "twelve finger breadths". The section following the duodenum is about eight times as long and is known as the *jejunum*. This word means "hungry", "barren" or "scanty" and refers to the fact that the jejunum is almost always empty in a post-mortem examination. The rest of the intestine is called the *ileum* which means "twisted", "rolled up together" or "kinked". This word might well be applied to all the divisions, for the small intestines are turned or twisted, or folded upon themselves so that they

occupy a surprisingly small space when one stops to think of their length—more than three times the height of a tall man.

The small intestines do not simply merge into the large intestine which, as we have said, has a much larger diameter. They end at the side of the first section of the large intestine a few inches from where it properly begins. Back of this point is a small part of the large intestine known as the *cecum* which means "blind". The cecum is, in reality, a blind pouch or sack. At its lower end is a small tail-like appendage known as the vermiform (worm-shaped) appendix. Its length may range from one-half to nine inches, but the average is usually three to four inches. At one time it must have had a particular function to perform, but in the course of evolution it seems to have lost its function in man and now causes serious trouble.

But to get back to the food which we left in the process of being digested. Each time the pylorus opens, the liquidy food mass or chyme passes into the upper part of the small intestine or duodenum. Here it usually remains until several of the small masses of food have been sent into it from the stomach, and here the process of digestion continues. The chyme is acted upon by three different digestive juices—the intestinal juice which is secreted by glands called Lieberkuhns follicles in the walls of the intestines, the bile and pancreatic juice.

As soon as the acid chyme from the stomach passes through the pylorus, the pancreatic juice begins to flow into the intestine and start its work. It is a clear, alkaline liquid containing three digestive enzymes.

One acts on protein foods, another splits fats into simpler compounds that can be absorbed, and a third, like the ptyalin of the saliva, breaks down complex carbohydrates into simpler forms.

Bile is a slightly alkaline solution secreted by the liver. It enters the intestines through the same duct as the pancreatic juice. It considerably increases the solubility of the fatty acids and decreases the surface tension between watery and oily fluids, thereby making a more perfect emulsion. All this helps to speed up the action of the enzyme of the pancreatic juice which splits up the fats.

The intestinal juice is markedly alkaline and contains five different enzymes which act upon the partially broken down proteins and carbohydrates.

While all these juices are acting upon the food mass, the muscular walls of the intestines are not idle. After a certain amount of food mixed with the juices has accumulated in the duodenum, it becomes divided into small sections by constrictions of the walls. The segmentation continues for several minutes so that the individual masses are carried back and forth with a rhythmical movement which greatly aids the emulsification of fat. The constrictions also bring about a further mixing of the food with the digestive juices and brings the digested food into contact with the absorbing membranes of the intestinal walls. After a certain variable length of time, the constrictions cease and the segments are carried singly by peristalsis or wavelike movements, or are joined together and move on in a single mass.

Absorption takes place very readily through the blood vessels and lymph vessels of the small intestines

so that the greater part of the digested food nutrients are absorbed before the chyme reaches the ileocecal valve which separates the ileum from the cecum. However, it has been observed that frequently the ileum is full four or five hours after the stomach has been emptied. Therefore there may be an accumulation of partially digested food in the lower part of the ileum. Here it remains and undergoes further digestion by the digestive juices with which it has been mixed, aided by segmentation of the intestine.

Large Intestine

Some time after the food mass reaches the valve, at certain intervals, the valve relaxes every time a peristaltic wave passes over the lower end of the ileum. This allows the food to pass into the large intestine. In contrast to the small intestine, the large intestine is only about five feet in length, but, as we have said, its diameter is of much greater width. Its width is variable, however. It decreases from the cecum to the sigmoid flexure, where it expands, and then it becomes smaller again in the rectum.

The large intestine, like the small intestine, is divided into three parts. The first, it will be recalled, is called the cecum, meaning "blind"; the second is called the colon which comes from the Greek word meaning the lower part of the bowels; and the third, rectum, signifying "straight".

The cecum is located in the lower right hand corner of the abdomen and is about two and one-half inches long and slightly wider across. The colon is divided into three sections which correspond to their respective positions. The ascending colon begins at the cecum

and extends upward to the lower side of the liver. Here it turns left and becomes the transverse colon, passing across the abdomen to the left side of the body. It then turns downward as the descending colon to the lower left-hand corner of the abdomen where it turns inward and backward to form the sigmoid or "S-shaped" flexure. Here it continues as the rectum which ends in the guarded opening called the anus. The anus remains tightly closed at all times, except when it is stimulated to open in order to permit the collected waste matter to pass out. The opening and closing of the anus is accomplished by circular bands of muscles called sphincters which are controlled by sensory and motor nerves. Under normal conditions the waste or fecal matter remains in the sigmoid until there is an accumulation large enough for it to move into the rectum which is normally empty. When the waste matter accumulates in the lower part of the rectum, it stimulates the sensory nerves of the mucous membrane, and by a reflex action the sphincter muscles relax and the contents is expelled through the anus.

But our food isn't ready to be expelled as yet—it hasn't even been digested completely. When the food enters the ileum, reverse or anti-peristaltic waves tend to force the food back towards the small intestine. The ileocecal valve, however, prevents the return of the food to the small intestine under normal condition. As a result the food mass is again thoroughly churned and fresh portions are constantly brought into contact with the intestinal walls to be absorbed. In addition, although it does not secrete a digestive enzyme of its own, the large intestine furnishes an alkaline fluid which aids the completion of digestion.

The cecum and the ascending colon become gradually filled with the passage of the food mass from the ileum. The filling takes place slowly except during and immediately after meals and the material remains in the large intestine for a day or longer. This is because the peristaltic movements which send the food mass onward, while they are stronger than the antiperistaltic waves, they are less frequent. During this time, a large part of the water and the remaining digested food products are absorbed, and with absorption the residual matter becomes more and more solid and finally assumes the character of feces or the "finished" waste matter of digestion.

We have now followed the course of food from the time it enters the mouth until the digested portions have been absorbed and the residue is ready to be evacuated. One of the principal reasons why we have described the process of digestion and absorption in detail is to impress the reader with the all-important role the intestines play in these functions. Most people are under the impression that the stomach is the principal organ of digestion and absorption and that the intestines merely serve to evacuate the waste. This is far from the truth. The stomach does little more than to continue the beginning stages of digestion started in the mouth and to act as a storehouse for the great mass of food. *By far the greater part of digestion and absorption takes place in the small intestine* and is completed by the large intestine. It is of utmost importance, therefore, that the intestines be kept in a clean, vigorously healthy state, not only that they may perform their function of elimination of waste adequately, but—and in many respects this is more

important—in order that digestion and absorption may be optimally completed. Unless the body is sufficiently supplied with the proper amounts of proteins, carbohydrates, fats, mineral matter and vitamins to be used to build and repair tissue and supply energy, life cannot go on. And we cannot repeat often enough that if one part of the digestive tract is not functioning properly, this malfunctioning will be reflected in the other parts. You cannot expect to digest and absorb your food properly if your colon is clogged with waste.

Intestinal Bacteria

Before we see how the waste is eliminated, we should say a few words on the bacteriology of the intestines, for it is a matter of considerable importance. At birth the gastro-intestinal tract of an infant is sterile, but shortly after various bacteria appear in the feces. These vary in type until the child is fed a general diet. The character of the bacteria flora then changes, and remains fairly constant for the rest of the individual's life. It varies to a certain extent, however, with the character of food consumed and with the implantation of disease-bearing organisms, such as the dysentery bacillus.

In the intestine there is a large number of bacteria which progressively increases as we go downward, until we find the large intestine literally swarming with them. Generally speaking, there are three or four main types of bacteria. The *Bacillus coli communis*, or in English, the common bacillus of the intestine, as the Latin name signifies, is the most regularly and fre-

quently found. Other bacteria regularly found are those that produce gas and those that produce acid. The predominance of one group over another may be affected by changing the content of the diet—a protein diet favors one type, a starch diet another.

The stomach is nearly always sterile since the acid nature of the gastric juice, as we pointed out, destroys most of them.

It has been estimated that each day's food in its passage through the alimentary canal is subject to the action of over a hundred billion bacteria. As we have said, these are chiefly found in the large intestine. Since they are regularly present, scientists have endeavored to ascertain whether they perform some beneficial function in connection with digestion. It is now generally believed that those bacteria which are habitually found help to protect the normally healthy individual against the invasion of the harmful types. *Bacillus acidophilus* is considered the type that is best fitted for this important function. Milk, fruit and vegetables, as well as lactose and dextrin, favorably affect the intestinal flora, as its bacterial content is called, by decreasing the amount of intestinal putrefaction. Cultures of the acidophilus bacillus combined in milk, candy and other forms of food may be taken to establish and maintain a healthy condition in the intestines.

So here we have another important reason for keeping the intestines in good working order: in every healthy individual there is a stalwart and numerous army constantly thwarting the invasion of enemy bacteria.

Elimination of Waste

And now, after all the nutriment has been absorbed and the flora of the intestines has done its duty, the waste matter is really ready at last to be evacuated.

The mechanism is interesting. Remember that the inner surface of the colon is peculiarly constructed. It consists of a series of half-moon or semi-lunar folds or ridges which slow up the progress of the contents. Thus the passage of the digested food is delayed and sufficient absorption of the digested parts is assured.

Evacuation is made possible by the state of the intestinal contents and by the movements of the intestinal walls. The liver, you will recall, secretes bile which is sent to the intestines through the bile duct. It mixes with the intestinal contents and softens and lubricates them so that passage will be easy and will not injure the linings of the intestines. In addition, back of the feces the longitudinal muscles contract, causing the intestines in turn to contract. The circular fibres cause them to narrow. These movements travel along towards the anus, through both the small and large intestines. While all this activity is going on above, below the contents, the intestines completely relax. Thus the feces is gradually carried onward to the rectum. At this point the presence of the feces stimulates the nerves which produce a relaxation and a consequent opening of the anal sphincters. Thus the fecal matter is expelled from the body. This act of defecation is usually aided by voluntary movements on the part of the individual. During the act, frequently without thinking about it, he draws deep breaths, holding for a few moments. This depresses

the diaphragm which indirectly exerts a downward pressure on the intestines. At the same time the abdominal muscles contract and exert a pressure towards the front and sides.

Normal elimination is easy and without strain or pain. It should leave you with a sense of well-being, of lightness and buoyancy. Moreover, you should feel that the waste matter has been completely evacuated. If you have to strain, or have pain or cramps or feel that evacuation hasn't been complete, you may be sure that your colon is not functioning as it should. And it is more than probable that the cause is constipation.

The frequency of evacuations of a normally healthy person varies considerably. Some have an evacuation every other day or every forty-eight hours, while others, apparently in good health, have as many as two or three a day. Generally speaking, the frequency depends to a large extent on the amount and kind of food and the ability of the individual to digest it. Naturally, if a diet is somewhat scanty, contains little roughage or is very thoroughly digested, evacuations will be less frequent. On the other hand, hearty eaters or those whose diet contains a large amount of indigestible or undigested matter, usually evacuate with greater frequency.

These cases represent the extremes of what is generally considered normal evacuation. The average person usually evacuates—or should—once every twenty-four hours if he eats well-balanced meals of normal quantity. But if you consider yourself a normal person and don't evacuate this often, don't let it worry you, provided you evacuate regularly and

completely. You might be running on a thirty-six or forty-eight hour schedule and are just as well off as the twenty-four-hourer. What is really important is *regularity with completeness of evacuation.* By being "regular" you are less likely to retain poisonous waste matter which would be absorbed into the blood again. Regularity is largely a matter of habit and can easily be acquired with a little patience. If, for example, you know from experience that you feel better if you have an evacuation when you get up in the morning, or after breakfast, make it a point to try and have a movement at that time. At first, of course, your efforts might be futile, or be rather long in producing results, but if your bowels are in a healthy condition, within a short time you generally won't have any difficulty at all. On the other hand, although regularity should be your goal, if during any other time of the day you should have an urge to evacuate, by all means don't neglect to do so.

A simple and very valuable way of ascertaining whether the intestines are functioning properly, in addition to the regularity of evacuation, is by an inspection of the stools themselves. To be sure, an exact interpretation of them requires the scientific experience of a physician, but a layman can often discover for himself whether his stools are normal.

The normal feces vary from a darkish yellow to a dark brown, depending upon the diet. They are usually sausage-shaped or cylindrical and definitely formed, but rather soft in consistency. Ordinarily, they are a little more than an inch in diameter, although this may vary with the structure of the individual. The daily amount eliminated varies, too, but on a normal

diet, it is between three and seven ounces. About one quarter of this constitutes the solids.

The feces contains any indigestible matter swallowed with the food and the undigested residues of digestible food material. They also contain, as we pointed out before, remains of bile and other digestive juices, together with certain products of metabolism that are eliminated by way of the intestines, and bacteria, both living and dead.

When the intestines are sluggish or inactive, the stools are often large and knobby. They are dry and hard, and of a dark color. Generally, the dryer the feces, the more straining is necessary for their expulsion. This is true even when there is a normal desire present. The difficult passage of the dry, hard feces frequently causes the mucous membrane of the rectum or the anus to be torn away and blood to flow. This is very serious, for permanent soreness, piles and fissures may well result.

Many persons believe that they are not victims of constipation because they have frequent desires to eliminate or have frequent and regular stools. They are often wrong, for the eliminations, while regular, may be small or incomplete, and waste matter may be gradually accumulating in the intestinal canal. For this reason, the quantity and condition of the feces themselves and not the frequency of their elimination is a more trustworthy guide when you are trying to find out whether you have constipation.

Diarrhoea produces a stool which in many ways is the opposite from that of constipation. It is usually semi-liquid in consistency, but it may become very watery. It varies from brown to green in color, the

latter being frequent in young children. The discharges vary between six and twenty a day.

A deficiency of bile due to obstruction from such causes as catarrhal jaundice or gallstones produces a pale, clay-colored, putty-like stool that is markedly greasy or fatty. A similar stool may be indicative of pancreatic disease. A milk diet or vegetable and milk diet may also produce pale-colored feces.

In persons suffering from mucus colitis or intestinal catarrh, mucus is present in the stools in grayish-white lumps. Or it may be expelled as membranous casts or strings or in masses similar to frog spawn. If it is very liquid it may make the feces semi-fluid.

"Tarry" or black stools usually result from decomposed blood from the stomach, liver or the intestines above the colon. They are frequently indicative of cancer or ulcers. If the evacuations are diarrhoeal in character, the stools may be bright red in color, as the blood from the ulcer or cancer has not had time to decompose. A tarry stool may also be the result of certain meat diets, or of blackberries, huckleberries, red wine or other foods which darken the stool.

On the other hand, if the blood comes from the colon or rectum, it can usually be seen on the surface of the stool, bright red in color. It may be the result of constipation—the tearing away of the linings of the canal by hard, knotty stools—or it may be caused by rectal cancer, polyps, ulcers, hemorrhoids or fistulas.

Hemorrhoids may also be indicated by flat stools, although certain uterine conditions and an enlarged prostate may produce the same kind. Stools that are pipe-like in shape usually point towards a prolapsed

anus, but they may be caused by starvation, spasm of the colon or the pressure of dry, hard feces.

Sometimes matter of a stone-like hardness is passed. These are often called concretions and may be composed of masses of fecal matter from which every bit of moisture has been absorbed. Or they may be gall or pancreatic stones.

Offensive, foul-smelling stools may be caused by any one of several conditions. Very often the diet is the cause. A large consumption of meat, for example, produces an offensive stool when putrefaction takes place. This is likewise true when certain foods which are odorous in themselves, such as garlic or onions, are consumed. Undigested food and the various processes of fermentation also produce offensive feces. Sometimes they indicate certain diseases such as rickets or jaundice.

Nearly all these types of stools may be present when one is suffering from constipation. However, this does not necessarily mean that they are caused by it. Quite the contrary, they may be the cause of constipation. In other instances the condition which is responsible for the particular type of stool may also cause constipation, and in still others the stool may appear entirely independent of constipation.

CHAPTER XIII

CONSTIPATION

Constipation or intestinal stasis may be acute or chronic. "Acute" refers to that type of constipation which occurs quite suddenly and which is usually of short duration. Ordinarily this type of constipation is quite easily and simply remedied. This is because the trouble usually lies in the colon and the rest of the digestive tract keeps on functioning normally. Such constipation may be brought about by emotional stress, change in diet or water, a prolonged or enforced inactivity, or unaccustomed travel by motor or train.

Generally speaking, this constipation, being of short duration, causes no discomfort or serious symptom, providing, of course, that it is remedied. On the other hand, in susceptible individuals—individuals of delicate constitution or unhygienic living habits—it may produce many of the symptoms of chronic constipation which we will discuss later.

While acute constipation usually takes the form we have just described, there are some forms of a far more serious nature. These result from some pathologic condition which interferes with the normal functioning of the intestinal canal. The pathological condition may disturb the nerves, the muscles, the action of the abdominal muscles or of the diaphragm,

or it may interfere with the secretion of bile or its passage into the intestine. Such constipation, commonly called "stoppage," produces very serious symptoms and a general condition of grave import. Therefore it demands the immediate and expert care of a skilled physician.

Ordinarily, however, acute constipation may be treated at home. But while it may be treated at home, it never should be treated lightly or neglected, for if it is, a chronic condition may result. Moreover, harsh drugs should be avoided as much as possible, for they, too, bring on chronic conditions.

Chronic constipation, as the name implies, refers to that form of constipation which lasts over a considerable period of time or which regularly occurs. This is the type in which we are particularly interested, for not only is it frequently difficult to remedy and often requires considerable persistency and will power on the part of the sufferer to do so, but it may be unrecognized for a considerable length of time. It creeps up on its victim, gradually and without his being aware of it, since he may have partial evacuations. Indeed, he may boast of the fact that he is one of the chosen few who does not suffer from it—and when he discovers it, very serious damage has already been done. We shall soon see how this partial constipation or costiveness, as it is sometimes called, can deprive an individual of his health and pretty near take the fun out of life.

Constipation, we said, refers to the clogging of the intestines with waste, either wholly or partially, and either for a short period of time or for an extended one. In addition, constipation may be atonic or spas-

tic, depending upon the nature of the cause and of the cure.

Spastic Constipation

Atonic constipation has for its immediate cause sluggishness of the muscles of the intestine. Spastic constipation, on the other hand, is brought about by a spasm or constriction of the muscles. The former type is the commoner one and is the type which concerns us. However, since nervousness is a state which is met with more and more frequently and since slenderness or actual thinness is considered beautiful and therefore is the goal of many persons, particularly women, this latter type is becoming more frequent. It seems wise, therefore, to pause here and say a few words about spastic constipation.

Spastic constipation is caused by spasmodic contractions of the circle muscle fibers of the intestine so that sections of the bowel may be contracted to such an extent that the passage may be no bigger than a little finger. Hence the food residue is temporarily blocked. When the fecal matter is finally passed, it is very acidy and usually has an offensive odor.

This condition frequently results from a hypersensitive nervous state and is often found in women of a hysterical, neurasthenic disposition, and those suffering from pelvic disturbances. It may, however, be found in normal persons when they are in a state of nervousness or when they have eaten some harsh, irritating foods. Persons of slender build are apt to be nervous and tense and to have intestines that are hypersensitive and easily irritated. They are more likely to suffer from spastic constipation than persons

of a heavier build and an easy-going disposition. However, anyone may acquire this type of constipation when under undue nervous strain, or as a result of chronic irritation of the colon, and sometimes after ulcerated colitis and chronic dysentery.

Spastic constipation, unlike atonic, is usually intermittent in nature. Sometimes the intervening periods are normal as far as elimination is concerned, and at other times the constipation alternates with periods of diarrhoea. The attacks are generally brought on by the eating of some food that is harsh or rough in texture, or in some way irritating to delicate, sensitive intestines. Naturally such foods are more likely to bring on an attack of this type of constipation when one is nervous and unstable.

Rest and relaxation and the removal of the psychic influences which are causing the nervousness are necessary for the cure of spastic constipation. The diet must be smooth and bland—milk, eggs, custards, cream soups, bread, fats and thoroughly cooked cereals are in order. On the other hand, the diet should contain sufficient fiber. This may be obtained from thoroughly cooked fruits and vegetables put through a sieve or finely minced.

We are in absolute accord with modern thought that every individual should be examined by his physician periodically in order that important underlying causes for various symptoms may not be overlooked especially where prolonged pain and bleeding are present. Careful and timely diagnosis has, in many instances, helped prevent a temporary condition from becoming chronic.

Atonic Constipation

Now let's turn our attention to atonic constipation, which is, we have said, by far the commoner type. Just how prevalent constipation is, would be difficult to say, but a well known life insurance company ranks gastro-intestinal diseases second in prevalence, colds and other respiratory infections being first. Hence we may say with reasonable surety that everyone suffers from constipation some time or other. But statistics aren't necessary to prove the prevalence of constipation. Just glance at the newspapers, walk along the streets and notice the billboards, electric signs or drug store windows, take a ride on a bus or street car—wherever there are advertisements the word constipation in large letters will be confronting you. A visitor from Mars might well surmise that we all were in the throes of a dread disease which was undermining our happiness, ruining our careers, breaking up homes and finally causing death. Nor would he be far from the truth. Constipation can, and often does these things; and it knows no laws—the old and the young, the strong and the weak, the rich and the poor all fall victims to its insidious preyings. Fortunately, however, there are sound and simple remedies within the reach of everyone.

The prevalence of constipation by no means implies that it is a necessary evil. Far from it! It is not an infectious or contagious disease like typhoid or scarlet fever. The only way you could catch it from another person would be to ape his unwholesome, unhygienic habits of living. For living habits are at the root of constipation. If your diet, sleep, fresh air and other

factors involved in your daily living are in harmony with the laws laid down by Mother Nature, elimination should take place regularly and thoroughly without you giving it any more thought than your breathing. In other words, we may blame civilization for constipation.

If you need proof of this statement, just think of the life of a hard working peasant. He works outdoors all day long, unhampered by binding clothing so that his muscles, especially his abdominal ones, are firm and strong, yet elastic and capable of relaxing. His diet is simple and contains plenty of roughage; he hasn't a worry in the world. Even the fact that his neighbor's wheat sprouted before his doesn't bother him too much, for after all, competition puts zest into life. He sleeps soundly but not so heavily that unfamiliar noises won't rouse him at once. And of course he eliminates regularly and usually after each meal. He is living a natural life.

Now compare your life with his. If you are a man, you probably get up at the last minute "that certainly was some party last night," wash, shave and dress in almost no time, and then, with one eye on the morning paper and the other on the clock, you gulp down a heavy breakfast, largely to avoid argument; or, if you feel like asserting your masculine prerogatives, you swallow a cup of coffee and make a dash for the train, bus or street car which carries you to work. An elevator carries you to your office where you sit until noon. Feel rather groggy, don't you? Wish you could take a brisk walk, but you've promised the boys you would meet them in the restaurant downstairs. . . . Two o'clock and you promised the boss to be

back by one-thirty! So long, boys—got to dash. . . . Five-thirty—just time enough to catch the bus home. Certainly glad the day is over—awfully worried about the boner you pulled—but maybe you'll get another chance. . . . Not very hungry, but you have a weakness for roast pork and apple pie. Tomorrow you'll do a little bragging at the office, for you've picked the swellest little cook in the world for a wife. Wish she wasn't so cross, though—you're doing the best you can. Why couldn't she wait till after dinner before she starts complaining about Junior's unmanageableness and housecleaning? She couldn't feel as tired as you.

But she *is* as tired as you are. Her day has been as contrary to the laws of nature as yours. Don't forget she got up a half hour earlier than you did, although she retired as late as you did. After cooking breakfast and rushing you off to work and the children to school, she simply couldn't think of eating, besides she was expecting a new cleaning woman. . . . Oh, why doesn't she show up? There she is at last. . . . Here's your lunch, children. What makes you so late? How many times have I told you to come straight from school? You've only got a few minutes now—and your lunch is cold at that. Oh, Mary, how did you tear your dress? Well, come upstairs and Mother will find another. . . . No, children, Mother can't stop to eat now, but she's going to the sewing club this afternoon and will get something to eat there. . . . That new girdle with the high waistline is tight—she can hardly breathe or bend, but it does give a streamline effect. Thank goodness she only has to go across the street, for she is awfully late and must be back in time to roast the pork. Besides, dinner must be a little

earlier than usual tonight as both of you are going to the Smiths to play bridge. . . .

It certainly was stuffy at the Smiths. Really they could open one window when everyone was smoking so much. And they really didn't have to go to all that trouble, serving such fancy eats—a light salad or a few sandwiches would have been just as good. . . . Well, let's turn in—must be at the office early tomorrow.

Causes of Constipation

It doesn't require a scientifically trained mind to see what is wrong with such a day—a day, too, that is all too common in any civilized community. Yet, as evidenced by the prevalence of constipation, colds and similar conditions due to unhygienic living habits, we are apt to neglect the simple rules of health. Therefore we shall review them in the following paragraphs which deal with the causes of constipation in detail.

First of all, there is diet. We have already discussed the question of diet in preceding chapters—the role of calories, vitamins, minerals, water in growth and health, as well as when to eat and how to eat. We have, moreover, followed the food mass from the time it enters the mouth until after the digested elements have been absorbed, the refuse is expelled from the body. Therefore, it will not be necessary for us to discuss them in detail here. There are, however, a few phases of the diet problem to be explained which directly concern constipation.

In the first place, errors in diet which may cause constipation are innumerable. One might almost say that there are as many as there are sufferers from

constipation, for individual characteristics and idiosyncrasies or sensitivities are an important factor. In the chapter on allergy, you will recall we learned that many persons are hypersensitive or allergic to common foods which scientific analysis and common experience have proven ordinarily to be easily digested and assimilable as well as highly nourishing. Naturally a digestive upset takes place when an individual consumes food to which he is allergic. Constipation may therefore well ensue.

But an allergic tendency is not the only way in which individuals vary. Some persons are so constituted that they require the strictest regularity in their diet, or can only digest so-called simple foods. On the other hand, there are many hardy souls who apparently can digest dishes of every nation, simple or rich, and who can, within reason, vary their mealtime or amount of intake without discomfort. If you are of the less hardy variety, you should, of course, do everything you can to build up your strength and resistance, but don't ever worry if you can't match your hardy brother pie for pie. It isn't necessary to be a gastronomic Atlas in order to achieve happiness, success and a ripe old age. All this may be achieved by keeping your body in the best condition possible, as far as your own particular constitution is concerned.

Age, sex, temperament and physical activity must also be taken into consideration in determining the best diet for an individual. Men, of course, require a large amount of food daily and are traditionally considered to have more robust digestive apparatus. Yet I defy any one of them to eat with continued im-

punity the unaesthetic conglomerations served at a women's bridge luncheon.

A person of a high-strung or nervous temperament usually requires simpler and blander food than one of a calm, even temper.

Climate, race and season are also of importance when considering the relation of diet to constipation. We are all aware, for example, that in the summer time most persons "feel better" on a lighter diet and one composed of less heating foods.

Yet, in spite of these individual variations, we all require a "balanced diet," that is, a diet which contains proteins, carbohydrates, fats, minerals and vitamins, in the proportion best suited to our particular constitutions, taking into consideration the varying factors which we have just mentioned. A poorly balanced diet or one that is deficient in any of these elements is sure to cause constipation.

An insufficient amount of vitamins, as we have already learned, is detrimental to health, growth and the proper functioning of the organism. While we have much to learn about these food factors, we know that they all are concerned with the proper functioning of the intestines, at least indirectly, and that Vitamin B is directly involved with the absorption of the digested food substances from the intestines. When there is a deficiency in this vitamin, the food absorption and the passage of the mass is delayed. The sluggishness of the peristaltic movements causes the intestines to become clogged with waste matter and constipation results.

An excess of sugar and starches in the diet may cause constipation, since they provide neither mechan-

ical nor chemical stimulation to the intestines. The other extreme is equally harmful—a deficiency of carbohydrates may be at the root of constipation, although few of us are naturally inclined to avoid this type of food. The reason is very simple. The pancreas, you will recall, secretes a digestive ferment or enzyme for each of the different food elements. However, if a particular element is not consumed, or its amount is insufficient, the pancreas will not secrete the ferment whose function it is to digest that element. Eventually then, the secretion of the pancreas as a whole will become less in quantity and efficiency. Now pancreatic juice aids in the digestion of fats, breaking them down into fatty acid and glycerin. These breakdown products help to keep the intestinal contents and to promote peristalsis. It is obvious that a deficiency of this secretion will cause the fecal matter to become hard and will render peristalsis difficult. It is also obvious that a deficiency of fats will have the same effect on the pancreatic juice as a deficiency of carbohydrates. Even if the ferment is present, if no fats are in the food mass, fatty acids and glycerin cannot be formed which aid in maintaining normal peristalsis and feces of the right amount of softness. An excess of fats, by reason of the overactivity induced, usually produces at first, diarrhoea, but constipation is bound to result eventually, either from the ingestion which results (most fats are not easily digested), or from the reaction which follows the diarrhoea.

Many of us are inclined to eat an overly large amount of proteins, principally in the form of meat. Putrefaction may result with its irritating effect on the delicate mucous membrane lining of the intestines.

Putrefaction means fermentation and gas which dilates the walls of the intestines, especially of the colon. The muscles lose their power to contract and the fecal matter which should be expelled, lies stagnant.

On the other hand, you will recall that we learned that proteins are muscle-building foods. If we do not eat a sufficient amount of proteins, the muscles become soft and flabby. Now this is just as true of the muscles of the internal organs as it is of the muscles we can feel and see. So often we are apt to forget this, as is entirely natural, since we don't see the muscles of the intestines, for example. The muscles of the intestines must be as firm and elastic as those of the biceps. If they are weak and flabby, fibers involved in the wave-like motion and the constriction-like motion cannot perform their function of elimination adequately and constipation sets in.

There are many foods which by reason of their richness in food value, should be highly nourishing. Yet they are called "indigestible" and are avoided by many persons. In reality, all our customary foods, providing they are fresh and prepared properly, are digestible. The fault lies with the individual, as we learned in the chapter on allergy, but it may also be due to the preparation, the manner in which it is eaten, nerve strain, or pre-existing constipation. However, whatever be the underlying cause, we may consider "indigestible" any food or foods which are not digested in the time or manner in which they ordinarily are, thereby causing gastro-intestinal disturbances and yielding an unusually large amount of waste matter. This undue bulk dilates the intestines, interferes with

the normal secretion of its juices and injures the mucous membrane. Furthermore, putrefaction and fermentation usually take place in the undigested mass, causing further disturbance. Constipation is inevitable, even in those cases in which it is preceded by diarrhoea.

It would be ideal, of course, if we could avoid those foods which disagree with us, but the exigencies of our mode of living virtually makes that impossible. We easily can, however, see to it that when we are compelled to eat food that is not going to agree with us, that the waste matter in the intestines, which is after all poisonous to us, is flushed out completely and as soon as possible.

Equally harmful, although in a different way, are those foods which have been over-refined such as white flour and certain prepared cereals. Such foods, while they might possess high caloric values, are usually deficient in roughage, in minerals and vitamins. Such foods are naturally constipating since they in no way stimulate intestinal activity.

Overeating may both directly and indirectly be the cause of constipation. An overly large amount of food will naturally produce an amount of waste which cannot be adequately taken care of by the intestines. Digestive disturbances arise and from the undigested food and the accumulation of waste matter a toxic condition frequently results. The walls of the colon are stretched and their muscle tone is weakened. This lack of tone increases the inactivity of the intestines and thereby causes an even greater accumulation of waste matter. In this way a vicious circle is set up.

Overeating may be harmful in another way. Usually

it induces to sluggishness and laziness. We've all had the experience, or at least have witnessed it, of overeating on some special occasion—on Thanksgiving Day, for example. The picture that follows the dinner that started off so merrily is familiar to all—young and old draped over couches or slouched in chairs, motionless and silent, some actually sleeping. One might survive such a dinner a few times a year without any ill effects, but imagine what would happen if he made a practice of it. Not only would the mind become dull, but every muscle of the body would become soft and flabby, for most of the hours which should be spent outdoors exercising and breathing in the fresh air are spent in complete inertia. Is there any wonder that the intestines become sluggish and cannot perform their functions adequately when one consistently overeats?

Undereating, however, may be just as harmful as overeating, and in many instances it may be even more so. First, take the matter of bulk. Bulk, we have learned, is absolutely necessary, in order to stimulate peristalsis. The result in undereating is the same as in the case of overeating—a loss of muscle tone and consequently an inability to expel the waste accumulations. Moreover, undereating usually implies a deficiency in vitamins and other food elements which are also needed for the proper functioning of the intestines.

Undereating has other serious effects, all of which may lead to constipation. The good nature of the fat man and the sour disposition of the thin man are proverbial. While thinness should not be taken as a measure of one's agreeableness, it so happens that a

thin person is so often disagreeable that it is natural to associate the two. Undereating, of course, is one of the principal causes for thinness, but whatever be the cause, an undernourished person is weak, high-strung and extremely nervous. This, of course, is reflected in the intestines and atonic or spastic constipation may result.

Undereating may cause constipation for another reason—one which is not easily remedied. The organs of the abdominal cavity are held in position by deposits of fat. If they do not have the support they require, prolapsus, that is, a falling or sagging of the organs, takes place. It is obvious that no organ can perform its functions adequately if it is not held in that particular position which has been given it by nature. This is as true of the colon as it is of the stomach. Since the supporting tissue is derived from the food we eat, a deficiency in food may cause prolapsus and hence chronic constipation will almost inevitably result.

We have repeatedly mentioned the fact that "bulk" is one of the factors necessary for proper elimination. That the reader may not be under a misconception, we should state that, although the bulk of the food intake is important, far more important is *the bulk of the refuse* after the digested elements have been absorbed by the blood. One might eat a large quantity of highly refined food such as a pudding made of white flour or cornstarch and a large quantity of sugar. After such a dessert is digested, very little residue or roughage would be left to stimulate peristalsis. What is required is a certain amount of indigestible fiber such as that found in green vegetables

and in fruits, both of which contain chemical elements that stimulate peristalsis. But one must beware of over-stimulating the intestines by consuming too much "roughage," particularly of the various bran foods which are often eaten to "cure" constipation. Oftentimes this so-called "cure" will aggravate rather than remedy the condition.

An inadequate intake of water can lead to constipation. The cells of the body cannot perform their respective functions properly, they cannot absorb nourishment nor give off their waste products and they are less responsive to nerve stimuli if they do not receive a sufficient amount of water from the blood stream. All functioning is less efficient when the consumption of water is low, but there is, in addition, a special direct effect on intestinal activity. Water aids in the formation of normal, soft feces by its absorption by the indigestible portions of the food mass. A lack of sufficient water tends to create a dry, hard bowel content which cannot be eliminated with normal ease.

By water intake we are not simply referring to the amount of liquid taken in the form of pure water, but to the diet as a whole. There are many delectable foods that contain a large amount of water and which form a part of a well-balanced diet, as for example, soups, milk, fruits, fruit-ades and various creamed dishes. These serve the purpose of liquid as well as pure water. Herein lies an inconsistency on the part of many so-called dieticians, who claim that drinking water with meals is harmful to the processes of digestion. In glancing over menus which they prescribe as wholesome, it will be observed the liquidy foods we

have just mentioned form a liberal part of the meal. Surely there can be no difference between drinking a cup of bouillon and a glass of water with one's meal, providing it is not ice water and is not used to wash down the food. Too much bouillon would have the same effect as too much water—it would take away one's appetite for other food and might retard digestion by diluting the digestive juices too much.

The diet itself is not the only factor involved in nourishment which may cause constipation. A person may eat wholesome food, and a healthful amount, but still suffer from constipation. This is because his eating habits are faulty. Irregularity in meal hours, an insufficient intake of food at one meal, too much food at another, hasty eating, eating when one is tired or under a severe nerve strain, all tend to produce constipation. As we have discussed this question at length in another chapter, it is not necessary to go into detail here.

It would be a fine thing if we could say to ourselves that we are going to adhere to rules of eating that best suit our particular constitutions. This, however, is impossible in any social community, no matter how small. All of us at some time or other have been under severe nervous strain and have had to carry on as usual; all of us have been compelled at times to hastily gulp down our food; all of us have been in unusual situations when we have had to eat irregularly. Therefore, it is quite safe to say that we all have at one time or another suffered from constipation because of unhygienic eating habits. Fortunately we have within our reach a simple and efficacious remedy.

In this enlightened era in which we live, most of us

are aware of the importance of diet and at least spasmodically attempt to eat a well-balanced diet regularly and under favorable circumstances. But, strangely enough, the average person makes no attempt to keep his bowels in a healthy condition and when they fail to function as they should, he resorts to dangerous methods of "cure." This is sometimes due to carelessness, but far more often to sheer ignorance.

Postponement of evacuation after a natural urge is a bad practice. Such postponement produces a large hard mass of fecal matter in the rectum. This makes elimination extremely difficult and accomplished only by severe straining; sometimes it can only be accomplished by artificial measures. Postponing has another grave aspect. After the normal desire has been neglected, it does not return for a long time, and then it is usually weaker.

Undue straining, whether caused by postponement or by habit, is very dangerous and can easily lead to constipation. Many persons, sometimes for no reason other than haste, strain the muscles of the diaphragm and the outer abdominal muscles in an effort to expel the feces. This may not only eventually cause hemorrhoids or a prolapse of the anus or rectum, but at the time of the desired bowel movement, it may increase the contraction of the sphincters which control the outlet for the waste, and therefore entirely defeat the object in view. A very light tension of the diaphragm and abdominal muscles is often helpful and may be used with safety, for it does not hinder the relaxation of the sphincters which is necessary for evacuation. But under no circumstances should straining be resorted to. If it is merely a habit, it should be stopped

at once, and if it is due to costiveness and hard, dry feces, the condition should be remedied.

Closely related to postponement is irregularity in evacuation. The intestines are peculiarly susceptible to habit, and when the habit of regular evacuation is not established, they may retain the waste products for a longer period of time than when one has acquired the "habit time." Elsewhere we have discussed the question of habit fully, so that here we have but to point out a further advantage of securing an evacuation at a *convenient* time.

While we are on the subject of habits, we should point out there is no habit so conducive to chronic constipation as the so-called drug habit—the habit of taking laxatives and cathartics to relieve acute constipation. More will be said on this subject in the sections dealing with the treatment of constipation. Here we shall only say that the after-effects of laxatives are conducive to chronic constipation. The so-called mild remedies for dyspepsia and other gastro-intestinal disorders may also bring about constipation for they frequently irritate the mucous membrane and the secretory cells.

Another common cause of constipation is lack of sufficient exercise. If you stop to think what a large portion of the human body is composed of muscles, it is obvious at once that unless a proper muscle tone is maintained, the organs whose functions are largely dependent on muscular action cannot perform their functions properly. This is as true of the internal muscles as it is of the external muscles—the heart, the stomach, the intestines and all the other organs composed largely of muscle carry on their work with

an efficiency which is in direct ratio to the tone of their muscle fibers.

Lack of sufficient exercise and sedentary habits are all too common amongst city-dwellers. In a large city, transportation is easy, much of the work requires little or no exercise, most easily accessible amusements are indoors, living quarters are small and often without adequate sunshine and fresh air. It is easy to acquire sedentary habits, which lead to laziness and sluggishness. Small wonder that the muscle tone of the intestines becomes weaker and weaker and constipation becomes chronic.

Sedentary habits not only have this direct effect on bowel functioning, but many indirect ones as well. For example, an inactive person usually overeats—this does not necessarily imply that he is eating more than he should if he were living a normal life, but that he is eating too much with reference to the amount of energy he is expending. Remember, overeating almost always tends to produce constipation. Moreover, it has been observed that those who do not get sufficient exercise are frequently the ones who postpone their response to natural desire, and who are irregular in their habits. This may be due to laziness at first, but it stands to reason that as the bowels become weaker in muscle tone and become clogged with waste, the stimulus to evacuate will become fainter. Since we have discussed exercise in detail in another chapter it is not necessary to speak of the subject further.

Closely associated with sedentary habits is the problem of clothing. It is clear to everyone that any clothing which restricts and therefore does not allow proper play of muscles in their position as ordained by nature,

is bound to interfere with the functioning of the organs which they support or compose. Yet fashion is so all-prevailing that if she rules that a particular silhouette be in vogue, no matter how unnatural it may be, it will be adopted. In this respect women are the chief offenders, but men are not entirely innocent.

While the old-fashioned corset with laces and stays has been abandoned to a large extent, the modern girdle of elastic is equally, if not more harmful. All the organs—the stomach, the diaphragm, the liver and the intestines are pushed out of their natural position, and worse still, the pressure exerted in every direction by the garment does not allow the natural movement of the muscles. The peristaltic movements of the intestines are restricted to a large extent and as a result, the waste matter which should be expelled is held back and constipation results. But this is not all. If we exercised sufficiently and walked and sat properly, as well as observed all the other rules of right living, it would not be necessary to wear tight foundations—unless the wasp waist or some other unnatural figure becomes the fashion, although, even at that, much can be achieved by the cut of an unrestricting outer garment.

However, the average person, particularly the woman, is careless and soon after she passes her teens finds that she bulges where she should gracefully curve. The quickest and easiest way to get rid of the bulge is to push it to some other region of her anatomy where she fondly believes it will not be noticeable, with the aid of a tightfitting garment that defies all the laws of anatomy. Consequently muscles lose their tone and soon cease to function normally. Chronic

constipation is the penalty she must pay for her stupidity and vanity.

In its turn, constipation produces sluggishness and aggravates the already weakened condition of the intestines. The well-known vicious circle is set up and it is almost impossible to discover which is cause and which is effect. The circle must be broken somewhere in order to restore a condition of normality. All the factors contributing to the condition must eventually be remedied, of course, but it is not possible to remedy them all at the same time or with equal quickness. It takes a long time to restore muscle tone and for organs to regain their proper positions—the latter, indeed, is not always possible. The logical place to break the circle, then, is to break up constipation. To endeavor to restore health by wearing proper clothing and enjoying sufficient exercise while the intestines are clogged with toxic waste substances is absolute folly. Let us take a simple analogy. Suppose your little five-year-old child had a decayed tooth which was causing her pain and making her ill and you took her to the dentist. What would you do if the dentist told you that her diet was deficient in the vitamins and minerals which promote the growth of strong teeth and prescribed a diet without filling or removing the bad tooth? There would be only one thing you would do—take her to another dentist who would not only prescribe hygienic measures to be carried out at home, but who would treat the sore tooth. Common sense tells you that no diet or other hygienic method is going to rebuild the decayed tooth and prevent its infecting the rest of the teeth and finally impairing her whole delicate little organism. To attempt to remedy chronic

constipation by exercise without regularly flushing the intestines and getting rid of the toxic wastes is just as absurd.

Before leaving the subject of tight clothing, we want to make it clear that we are not advocating the discarding of all supporting garments. Young persons may be able to do so without discomfort or harm, and with considerable benefit, but older persons who have worn supports for many years are likely to feel marked discomfort physically, and the embarrassment and other emotions experienced because of their consciousness that they don't look their best, may indeed do more harm than good.

We have now reviewed all those factors tending to produce constipation which belong to the hygiene of our daily lives. Most of them are the result of indifference and laziness or of ignorance, and the damage caused by them, provided it hasn't reached a too advanced state, may be repaired if patience and common sense are exercised. Unfortunately, however, as we have previously intimated, there are many other internal and external conditions which may produce constipation and over which we have little or no control.

Chief among these forces we may rank our emotions. Grief, fear, worry, fright, anger, exhaustion of mind and body, all may reduce the secretions of the intestines to such an extent that bowel action may be seriously delayed or reduced. How this can be, can be readily understood, if you but recall what we have written previously about the secretion of the "appetite juices" as an aid to good digestion. It has been proved, we noted, that these juices are secreted when you are

in pleasant surroundings and in a happy mood. There is another, more tangible proof of the effect emotions have on internal secretions. We all have experienced a dry mouth when we have been frightened or grief-stricken.

The emotions may also tend to produce constipation in a less direct way. Most of the cases of so-called nervousness can be traced to undue mental and emotional strain. Since all our organs function through the nerves, it is obvious that any disorder which involves the functioning of the nerves, will affect the action of the intestines. Frequently diarrhoea results, but it is always followed by constipation. In the section on spastic constipation we have discussed the question of constipation in neurasthenic or neurotic persons, hence there is no need to go into more detail here.

But there is one thing we want to say before we leave the subject. It is difficult for us to avoid real worries and fears, but with a little will power most of our pet imaginery worries can be dispelled. There is one worry, however, whether the object be real or imaginary which can and should be got rid of at once. This is the constant worry of hypochondriacs over intestinal inactivity and the innumerable consequences that may result. Such worry alone is sufficient to bring about constipation or to aggravate a preexistent mild case. Since constipation may increase the nervous condition, the familiar vicious circle is set up and both the nervous disorder and the constipation are aggravated to the serious detriment of the whole constitution.

As we have said, the perfect functioning of any organ depends not only on a healthy condition of the

nerves which supply it, but on the muscles as well. You will recall that we have repeatedly stressed the need for a good muscle tone, but this alone is not the essential. Normal structure and position are just as necessary. If for any reason—and poor muscle tone is frequently the underlying cause—an organ is prolapsed or sags, its retarded or feeble functioning will eventually result in serious damage, although in the earlier stages the victim will be unaware of the abnormal condition.

The stomach is very prone to prolapsus or sagging, but the small intestines, because of their convoluted, irregular structure and position in the abdominal cavity, are less subject. The large intestine, on the other hand, is equally, if not more subject to sagging than the stomach. Some of the serious cases of constipation can be traced to the sagging of the large intestine.

There are many other structural and mechanical abnormalities which cause constipation. Among them we find strictures which may be the result of inflammations or operations. When they occur in the intestines, they contract the walls and therefore narrow the opening.

Adhesions produce a similar result. They may be due to appendicitis, peritonitis, intestinal or pelvic inflammations or the other effects of major abdominal operations. They may join the wall of a part of the intestines to the wall of another part, or they may join the intestines to another abdominal organ. This interferes with peristaltic action.

The same inflammations which we have just mentioned as a cause of adhesions may produce kinks or twists in the intestines. This results in the complete

blocking of the intestinal contents. Similarly a hernia may produce persistent constipation and even a complete blocking of the intestinal tract and vomiting. Naturally such a condition requires immediate action, not only to bring about normal evacuation, but to prevent the circulation of the part of the intestine protruding through the hernial opening from being blocked and to prevent gangrene.

If the liver or the gall bladder or the bile duct is congested because of any organic or functional disturbance, the duodenum does not receive the proper amount of bile. Not only is intestinal digestion impaired, but the food mass and fecal matter do not receive the lubricating or the other beneficial effects of the bile which promote good bowel movement. Constipation is invariably the result.

Tumors in the abdominal cavity are frequently causes of constipation. Sometimes they exert a direct pressure on the walls of the intestines, thereby narrowing the passageway through the canal. Again, by exerting pressure on another organ which in turn pushes against the intestines, the same result is produced. In other cases they may interfere with secretory glands.

Pregnancy is a frequent cause of constipation because the foetus, by exerting pressure on the large intestine may interfere with the peristaltic movements. An obstinate case of constipation may well result.

Likewise an enlarged prostate or a prolapsed uterus, or where either organ is otherwise out of its normal position may result in constipation.

In addition to these conditions which are located in the abdominal cavity itself, there are many systemic

or organic diseases which are accompanied by constipation. Any disease, whether it is a "cold" or one that seems to be of graver import, when accompanied by fever, usually has for one of its symptoms, constipation. This is because the functioning of the glands of internal secretions is considerably weakened, as well as the normal peristaltic action of the intestines. Very often, too, the absorption of fluid from the intestinal tract is more rapid than when the body is functioning normally. And just as in the case when you don't drink enough water, dry hard feces are produced which are extremely difficult to eliminate.

The underfunctioning of the glands of internal secretion such as the pituitary and thyroid glands, is usually accompanied by obstinate, chronic constipation. Anemia is often associated with constipation. Sometimes it is the cause of it and sometimes they both arise from the same general causes. While anemia is sometimes the result of factors beyond our control, it is frequently due to improper hygienic and dietetic habits, just as constipation is. Diabetes is frequently a cause of constipation. Rheumatism, gout, arteriosclerosis and diseases of the lungs, heart, liver, kidney and pancreas—in short any disease which results in muscular atony or sluggishness of the intestine—may result in constipation—temporary or chronic.

To sum up the causes of constipation, we may say that they may be drawn together under three broad classifications. First and foremost are all those causes which may be classified as wrong living habits. Under this heading we may put improper diet and eating habits; insufficient exercise, sleep and fresh air; restricting clothing; poor posture; careless habits of

elimination, such as irregular and incomplete evacuation and undue straining; the use of drugs and other harsh remedies purported to "cure" constipation; overwork and worry.

In the second division we may put malformation and other conditions which are present at birth, although they might not be recognized at the time; and conditions which are similar in nature, such as the malposition of the stomach or uterus, which develop later in life. The cause or causes of the latter is frequently found in the first group.

In the third division we may put organic diseases and "infections" which weaken the motor and secretory functioning of the intestines. When fever accompanies such diseases a general weakening of the intestinal canal takes place. Moreover, because of the greater absorption of fluid from the intestine, the feces become dry and hard and evacuation is difficult.

The first group is by far the most important, as far as we are concerned, for several reasons. In the first place, practically all of us at some time or other have suffered from constipation that was caused by one of the factors mentioned in the group. In the second place, with a little common sense and patience, most of these causes can be practically eliminated. Furthermore, many of the disorders listed in the other two groups can be eliminated if the errors and careless habits acquired in the course of our daily lives are corrected. In this connection, do not forget that when constipation, particularly chronic constipation, is present, a vicious circle is set up and it is difficult to distinguish between cause and effect. The constipation which might have started as a result, becomes a cause.

Symptoms

Constipation, we have said, is not a disease entity. It is a sign or symptom—a sign that your body is being neglected or abused, or that some invading force has weakened your system and, in spite of your body's gallant fight, is gaining control of it. It is a symptom of an abnormal condition in the same sense that fever is a symptom. But there the analogy ends. Fever means that your body is fighting and hence frequently is a good sign.

Constipation, on the other hand, can never be construed as a good sign; we take it as a warning, not only to remedy the condition itself, but the underlying cause.

If you keep it in mind that constipation is a sign—a warning that your intestines are not functioning as they should, no matter the cause—and that poisonous substances are being absorbed into your blood and carried to all parts of your body, you will readily understand the significance of the host of symptoms that accompany intestinal stagnation and its grave, far-reaching effects.

Let us first consider the symptoms which usually accompany intestinal stagnation and the general toxic condition caused by the absorption of the poisonous wastes which should have been expelled. We have all been familiar with them from childhood, although at the time we probably did not recognize their cause. We were fully aware, however, that if we were cross and disobedient or refused to eat our cereal (spinach hadn't reached its glory in those days) the castor oil bottle was soon in evidence. Even now as adults, we

fully recognize the symptoms in others, even though we are all too apt to overlook them in ourselves or not to recognize them at all. Hence it will not be amiss if we briefly review them. At the outset of constipation we may or may not be aware that the intestines themselves are not functioning as they should. This is because we might have a regular movement, but unbeknown to us, the evacuation is not complete. Part of the waste matter which should have been eliminated is still in the intestine and the blood is absorbing its toxic substances. As we have said before, regularity in itself does not mean freedom from constipation. This partial constipation or costiveness may continue for some time and is, therefore, in some respects even more dangerous than a complete stoppage of the intestinal contents which is easily recognized.

So, before or at the same time that we notice that we are constipated, we usually feel headachy or irritable. Frequently we feel lazy or sluggish, both physically and mentally. We are "too tired" to join in any fun. We can't think clearly or quickly and just stumble through our work somehow. Our work bores us, our friends annoy us and we feel depressed. Our favorite dishes taste flat and we go in for strange diets or "cravings", but nothing satisfies us. A glance in the mirror would reveal a coated tongue and friends might tell us that our breath is highly disagreeable, if we weren't so "touchy" as we usually are when constipated. Nights are agony—tossing, twisting, turning —sleep never comes, or if it does, it is full of weird dreams and nightmares, and when morning comes at last and we are warned that "if we don't get up at

once and hurry, we'll be late" we are more tired than when we went to bed.

Not only is there a loss of appetite, but digestion becomes indigestion. This may be manifested by a burning sensation in the stomach, belching, a bloated sensation, retasting in the mouth of recently consumed foods, or in extreme cases, even nausea or vomiting. Frequently a sensation of heaviness is experienced in the abdomen, sometimes right in the stomach.

The complexion becomes muddy or sallow and dark circles appear under the eyes. Indeed, the eyes themselves are dull and lusterless and the lids feel heavy. Eruptions in the form of acne, pimples and blackheads break out, on the face and body. They are persistent too and you may be sure that no amount of external treatment, while it may help, will make them disappear.

All of us are acquainted with these symptoms—and it is more than likely that we are personally acquainted with them—but, as we have said, when they are met with in ourselves, we either neglect them or fail to recognize them. Worse than that, even when we do recognize them, we seldom stop to think of the terrible significance of them. They are, after all, but signs of impending harm that is going to effect not only our health and our happiness but our very existence.

Effects

First of all let us consider the effect that constipation has on our happiness, the ability to enjoy ourselves and to give pleasure to others, on our work and financial condition. Most of us, if we were asked what

was the greatest blessing we can have, would promptly respond, health. But not because health in itself is a thing of great value, but because it is *only through health that we can attain to those things which make life worth living.* Constipation, gradually undermining our minds and our bodies, deprives them both of the vigorous health that should be theirs.

Suppose for a moment that you yourself are suffering from constipation. You get up in the morning after a troubled sleep, feeling groggy and headachy. You struggle into your clothes, telling yourself that you'll feel better after a cup of coffee. But the coffee tastes like mud and makes your stomach burn. Somehow you struggle through your work, but you make a lot of blunders and are short with those under you to the point of harshness. And when work is finally over, you are in no mood for play. Your friends bore or annoy you, you're tired and want to be left alone to brood over your troubles. Even your family irritates you. As the days go by you find that others in your organization, in your community are forging ahead. For example, you've had twice the experience that Jones has had and you were formerly more successful. What's the matter with the outfit, anyway? Well, Jones probably has a lot of drag. What's the use of trying? There's no justice. And, if you are a woman and a homemaker, it's just as bad. Not a word of thanks for the hours of drudgery you've spent, not a single word of thanks for the hours you've spent over a hot kitchen stove. Not a word of thanks for being a good mother. Only complaints.

As for your hours of relaxation, even when you feel like doing something, there is no one to do it with.

Your friends and family are too busy to bother about you. After all you're nothing but a spoil-sport, a stick-in-the-mud, an old grouch. Anyhow, why should you be stared at because you have a few pimples and look a little sallow? Who wouldn't look sallow when he has slaved and worried the way you have? Why, you're really glad that no one asked you to go out . . . Guess you need a vacation. But you don't need a vacation.

If you weren't so touchy, your friends would tell you that you exhibited every symptom of bowel sluggishness, and that you could free yourself of the constipation that was ruining your life.

The evils of constipation do not stop at mere outward sluggishness. They may reach to every part of your system and impair your general constitution if they are not checked in time.

One of the commonest pathological conditions associated with constipation is the so-called common cold. It is now generally believed that the common cold is directly caused by a filterable virus, that is, a micro-organism smaller than bacteria. However, it is much easier for the virus to successfully invade the system when it is run down and not functioning properly as is the case when one is constipated and when one's socalled alkaline reserve is lowered. Many authorities are at least justified in assuming that constipation is a probable contributing cause of colds, and one of the very best ways to catch cold is to let the bowels become impacted and clogged with waste. But not only may constipation lead to colds, but in the opinion of many doctors, a cold usually leads to constipation since the entire system is run down, the acid-alkali

balance becomes disturbed, and with weakened resistance, the "bug" establishes itself.

In any case, we may be sure that constipation is present either as cause or effect of many bodily disturbances.

It is obvious, therefore, that if the bowels are kept open, colds are less likely to develop and that if a cold does develop, the first thing again is to be sure that the bowels are functioning properly, thus doing their part to check the infection. Statistics, as we pointed out before, show that everyone is practically allotted at least two good colds a year! When we pause to consider what this means in terms of time, energy, money and happiness—and even life, for colds are frequently the forerunner of more serious ailments—the importance of regularly ridding our bodies of body waste that may induce a cold is immediately clear.

Rheumatism or rheumatic fever, as it is now generally called, is frequently associated with gastro-intestinal disturbances and constipation. This disease is of great seriousness not only because it is common and not easily recognized, but because most of the heart diseases in children and the young are caused by it. Therefore it is the cause of invalidism all their lives and is a constantly underlying menace of secondary infection by destructive bacteria that produce fatal forms of a certain heart disease called ulcerative endocarditis. According to statistics, rheumatism accounts for nearly nine percent of all cases of illnesses and it has been estimated that rheumatic disability in this country causes a loss of 7,500,000 weeks of work, of a loss of approximately $200,000,000.

The cause of rheumatic fever is still debatable.

Many authorities believe that it may be caused by some form of bacteria; still others that it is due to one of those elusive filtrable infective agents. There is still, however, a school of considerable importance that believes it is due to some dietary cause—possibly acidity. But whatever be the immediate cause, gastro-intestinal disturbances and constipation are usually present. Therefore, constipation may possibly be considered an associative factor in the production of the disease if not a probable cause. In either case, the importance of keeping the bowels open in order to help prevent recurrent attacks and to hasten recovery is obvious. And if rheumatic fever be due to constipation, the importance of maintaining a clean intestinal tract is equally obvious.

According to a well-known authority, chronic arthritis causes more prolonged disability, suffering and economic loss than any other chronic disease, including tuberculosis. The consensus of opinion inclines towards considering this disease a streptococcus infection, yet the precise organism causing it has not yet been found. There must be other factors responsible. At any rate, arthritis thrives in a body with lowered resistance—and lowered resistance potentially represents a state of "arthritic diathesis", an increased susceptibility toward chronic infections.

Many authorities believe that the gastro-intestinal tract has an immediate causal relationship to the disease. For one thing, the secretion of hydrochloric acid in the stomach may be decreased or absent in persons suffering with arthritis. Moreover, there is frequent occurrence of intestinal stasis or constipation in this disease. Hence, even if the condition be due to some

form of bacteria, the intestinal tract may well act as a focus for the infection, that is, it may act as the source of the bacterial invasion. The fact that the colon actually increases in length in arthritis and dysentery, colitis or where a state of chronic constipation exists, confirms this opinion. Moreover, the presence of an excessive amount of starch has been frequently observed. In any case, the bowels must be kept open and in this connection colonic irrigations are very frequently given.

Muscular rheumatism or myalgia is also associated with intestinal disturbances. It is due to mild infections caused by bacteria from foci such as are related to arthritis. The only difference is that of location—myalgia is confined to the muscles. Sufferers with this affliction, in the great majority of cases, suffer with dyspepsia and often find that attacks are brought on by dietetic indiscretions. The weakened power of the intestines naturally facilitates the direct absorption of toxins in the waste that has not been eliminated. For this reason one of the most important phases of the treatment of this condition is a thorough cleansing of the intestinal tract.

Lumbago likewise calls for general eliminative action since constipation is apparently in many instances an associative cause. An effective purge at the earliest possible moment is indicated by many authorities both in acute cases of lumbago as well as sciatica.

The immediate cause of gout is unknown and it is often confused with arthritis. It is common in those who overeat, yet it also occurs among those who feed on comparatively simple and meager fare. Some investigators believe that alcohol is an important factor.

Apparently it is frequently hereditary,—not uncommon in persons of great mental and bodily vigor. Worry and shock will often precipitate an attack. We know that, in some cases, it is connected with disturbances of protein metabolism and the retention of uric acid. Irritability and dyspepsia are evident in the beginning of an attack. During the attack severe gastro-intestinal symptoms with pain, vomiting and diarrhoea are usually present. Hence in the treatment the diet must be moderate and the bowels must be kept open as intestinal disturbances are at least a secondary cause. Likewise, in the prevention of the disease, it is equally important to eat moderately and to keep the bowels open.

There are many other illnesses which are frequently either directly or indirectly caused by constipation or which are greatly aggravated by it. Among these we find high blood pressure and arteriosclerosis; and sometimes instead of high blood pressure, low blood pressure is associated with the condition. Goiter and thyroid disturbances, diabetes, premature old age and defects in hearing and sight are mentioned by some authorities.

Since constipation may produce so often such far-reaching and serious effects, is it not pretty nearly absolute folly to neglect such a simply remedied condition as intestinal sluggishness?

The ailments which we have just discussed are of a more or less general nature. Constipation, in addition, is at times the apparent cause of many very grave conditions located in the intestines themselves or within the abdominal cavity.

The first effect of constipation is, of course, a dis-

tention of the intestine. At first the distention is temporary and when the bowel is rid of the waste that is clogging, the normal contours are resumed. But if elimination is delayed or if constipation becomes chronic, the muscles naturally become weaker and weaker and eventually remain dilated. Partly due to the pressure exerted by the retention of waste and partly due to the absorption of toxins reducing the tone of the mucous membrane and other structures making up the intestinal walls, hemorrhoids or piles may result.

Ulceration or catarrhal inflammation of the intestines may also be caused by constipation. Appendicitis may result—one of the commonest conditions traceable to constipation. Sometimes the inflammation may be so far-reaching that in the process of healing the scar tissue draws the wall of the intestines together to such an extent that the elimination passageway is greatly narrowed, thereby causing a partial closing of the passageway or stricture. Even total closing of the intestines may result from very severe constipation. As we learned, when the intestines do not expel the fecal matter, its moisture is gradually absorbed and the mass becomes harder and harder until it is almost absolutely stony. When this results, it can be removed only by manipulation or special enemas.

A prolapsed anus or rectum may be brought about by constipation. This condition is characterized by the protrusion of the mucous membrane and sometimes even the muscular coat of the rectum through the anus. It usually occurs in children, but it may occur at any age. General debility may be the ultimate cause, but constipation is frequently the immediate cause.

Constipation is also a source of grave danger for the pelvic organs other than the intestines themselves. Look at the illustration of the organs in the abdominal cavity—*in front of book*. See how compactly and neatly they are arranged, with every bit of space in the cavity occupied. Now imagine a large bulge in the rectum—a mass of waste that should have been expelled. It is immediately clear that the bulge is occupying space that should be occupied by other organs. As a result the organs are pushed out of shape and jambed together in such a way that they cannot perform their functions properly. And when they do not function as they should, the whole state of health is affected. A host of symptoms, various pathological conditions may well result.

This is particularly true of those organs which are concerned with digestion—the liver, for example. The bile, secreted by the liver, you will recall, among other things, aids in intestinal digestion, lubricates the fecal mass and stimulates peristalsis. The bile is either poured directly into the duodenum through a duct or is stored in the adjacent gall bladder to be used as needed. The hardened, stagnant fecal mass may directly block the flow of the bile into the intestines. Since the liver continues to secrete bile, both it and the gall bladder becomes congested and some of the bile is taken up by the blood. If the condition is prolonged, the liver may become inflamed. Moreover, if the duodenum is suffering from a catarrhal inflammation, the inflammation may extend to the bile ducts, with the result that both the mucous excretion and bile may pass into the bowel and a certain type of jaundice develop. And since the intestine is

not getting the amount of bile necessary for good digestion and lubrication, the constipation is further aggravated and the well-known vicious circle is set up.

So-called bladder trouble may arise in either sex as a result of the crowding and pressure. As the capacity is naturally decreased, emptying more frequently than normal is necessitated. Far more serious than this, however, is the fact that the irritation may be sufficient to produce a definite inflammation which may well extend up to the kidneys themselves if the bowels are not cleansed of the large mass of fecal matter, the original source of the irritation. Furthermore, large masses of waste swelling the rectum may cause serious functional and organic disorders of the prostate and seminal vesicles in the male by exerting undue pressure. Similarly, by crowding the genital organs of the female, waste matter accumulated in the rectum may, in some cases, possibly produce prolapsus of the uterus. Sometimes it pushes the uterus to one side, or forward. When it assumes such positions, it naturally becomes swollen and inflamed more easily. The inflammation causes the cells of the organ to increase, thereby increasing the weight of the organ. Sometimes the enlarged and heavier uterus may in turn crowd the rectum to such an extent that again the elimination of waste is hindered. Thus the so-called familiar vicious circle is set up again.

This pressure of a clogged colon upon the uterus is frequently the cause of painful menstruation or dysmenorrhea. Every woman knows only too well what painful menstruation means—hours and hours of physical agony, nervousness and irritability which often result in depression and "touchiness"—even melan-

cholia, not to mention the loss of precious time that should have been devoted to work or play.

Constipation may also be the indirect cause of leucorrhea, a lowgrade inflammation of the mucous membrane of the vagina and uterus. Whatever be the direct cause of this affliction, it is known that pelvic congestion is often associated with it, and as constipation produces pelvic congestion, it may be considered at times a contributing factor of leucorrhea. Moreover, even if constipation is not a contributing cause, it most surely aggravates it, sometimes delays its cure.

Constipation not only is the cause of the specific ailments and conditions which we have described, but when it becomes habitual or chronic, it may induce a general wasting of the entire body. As the whole digestive tract is affected, a state of virtual starvation gradually develops. The result is, of course, a loss in the body tissues and consequently a loss of energy. Because of this starvation and the absorption of toxins into the body, the skin frequently assumes a typical look of lifelessness, a peculiar grayish or yellowish hue.

Thus we see that constipation not only is many times the cause of headache, sluggishness, poor appetite, nervousness and irritability, insomnia, but both directly and indirectly when the condition is allowed to become chronic, it may be the cause of very grave ailments more difficult to cure, if they even can be remedied at all.

Fortunately, constipation itself may be prevented in many instances, and in others corrected, by a simple treatment which is within the reach of all.

CHAPTER XIV

TREATMENT OF CONSTIPATION

If we were able to lead the ideal life which Nature planned for us, a life free from anxiety and so ordered that we regularly got plenty of sleep, exercise, fresh air, relaxation and a well-balanced diet, beyond a doubt constipation would be a rare affliction.

But, as we have repeatedly said, we are human beings, not dumb animals. We are emotional and therefore we love, hate, fear, laugh and cry. We are thinking, reasoning creatures and we have ambitions and aspirations and an enormous amount of pride and self-respect; we are gregarious and like to share our thoughts, our joys and sorrows with our fellow-beings.

And there is an animal side to us, too—the side which makes us eat excessively of rich food, to drink and smoke too much, to forgo our exercise for a comfy loll in a soft-cushioned chair in an overheated room and to do all sorts of things in defiance to our natural delicate, sensitive, susceptible mechanisms. As long as we are so complex, and this complexity will ever drive us to do, to experience and feel things which are in defiance to the laws of Nature, constipation will exist, and exist to a very great degree.

In other words, as long as human nature is what it is, we shall have constipation, and it is safe to say that every one of us, at some time or other, no

matter what care we take to prevent it, will find ourselves in a condition which may easily bring on constipation.

Whether we are taking measures to prevent recurrent attacks of constipation, or whether we are treating acute or chronic constipation, the procedure and the remedies are the same. First, all the rules of hygiene which we have described in previous chapters must be adhered to as far as it is possible in accordance with the life we must live. That is, we must endeavor to get a sufficient amount of fresh air, sleep, exercise, a balanced diet, bathe daily and avoid worry as much as possible. As these rules have been fully discussed there is no need to repeat here. The adherence to the rules should theoretically make any further measures unnecessary. In reality, however, this is not the case. Whenever there is a tendency to constipation or costiveness, or when chronic constipation is present, it is necessary to take measures which are aimed directly at the condition.

As we have said, the thousands of remedies on the market—not to mention an even greater number of home remedies—testify to the prevalence of intestinal disorders and constipation in particular. Yet, in spite of the vast number of remedies, they may all be drawn together under two main groups which in turn may be roughly subdivided into a few broad groups. So what seems at first glance to present an embarrassing richness to choose from, thereby creating confusion and skepticism, dwindles down to an amazingly small number, each with distinctive characteristics of its own.

Generally speaking, laxatives and cathartics may be divided into two classes, according to their manner of

functioning—mechanical and chemical. A few may belong to both classes. As the name implies, the first group includes all those laxatives and cathartics whose action is purely physical or mechanical. That is, they act as intestinal lubricants, or by increasing the bulk of the feces tend to excite the nerve endings which control the peristaltic movements of the intestines. In this group, then, we may put lubricants such as the various petrolatum preparations on the market; the salines and mineral waters; bran, agar-agar and similar "bulk" producing foods. We may also include in this group the ordinary enemas and high colonic irrigations, because their action is mechanical. Their method of application, however, warrants placing them in a separate class.

To the second group belong those laxatives and cathartics which effect elimination through their drug action, such as castor oil, cascara, aloes and calomel.

The "J.B.L. Cascade", as we shall see, belongs to the first group by reason of its almost purely mechanical action. However, the use of the Cleansing Powder as a part of the full treatment justifies its inclusion in the second group as well—but with this reservation and distinction—it is always healing and soothing. This cannot be claimed for the majority of laxatives in the chemical group.

It might seem to the average person that the choice of the thousands of remedies purported to insure intestinal cleanliness was immaterial if elimination was achieved. Nothing could be farther from the truth—the selection of such a remedy requires the very utmost consideration, and intelligent consideration. Pain and discomfort, dehydration, exhaustion, disturbance of

sleep, loss of nutrition, permanent damage to the intestines, in fact the whole system, can and frequently does result from the use of the wrong remedy.

The right remedy—the only one which should be used—is that which secures the desired result with the least possible discomfort, the mildest remedy, unaccompanied by any possible danger to the intestinal tract and to the body as a whole. Moreover, it should not only temporarily relieve constipation, but should aim to gradually restore the normal healthy tone of the intestines and their normal, healthy functioning. Keeping these qualifications in mind, let us examine some of the more popular remedies with a view to selecting the right one.

Mechanically Acting Cathartics

First of all, let us consider bran, popularly called a "food" laxative. While it was believed for a time to have a chemical action, it has now been established that its action is mechanical. It increases the bulk of the intestinal contents and by reason of the spicate shape of its particles irritates the nerve endings of the intestinal walls. This twofold action induces peristalsis and the feces are expelled.

On first thought it would appear that bran was an economic, pleasant and convenient remedy for constipation. However, it has some decided disadvantages and in many cases is a positive menace to health. Some persons find that bran is highly irritating to the mucous lining of the intestinal tract and therefore may result in serious injury. This is particularly true of persons suffering from ulcers, colitis or other disorders of the intestinal tract. You will recall, too, that, while

atonic constipation is by far the commoner, spastic constipation is frequently found, even in persons who are otherwise healthy. Bland, soft diets are indicated in cases of this type of constipation. Bran would only intensify the spasticity, necessitating mechanical or surgical removal of the obstruction. If spastic constipation were always recognized as such and treated accordingly, danger from bran would be eliminated. Unfortunately this is not always the case.

Moreover, it has been the experience of many individuals suffering from atonic constipation that when they eat bran, either in large doses over a short period of time or small doses over an extended period of time, their colons become irritable. Sometimes vague abdominal pains occur with bloating, belching and flatulence.

The prolonged use of bran may result in malnutrition, which implies serious constitutional disturbances and the breakdown of general health. Bran is intended as a remedy for constipation due to insufficient bulk. This implies that the ordinary intake of food is not normal in bulk and that, therefore, in most cases, is deficient in the nutritive elements. Bran, while supplying the deficient bulk, does not supply the missing nutrition, despite the claims made for its mineral and vitamin content. Such elements are relatively small in amount in the quantities usually consumed of the commercial bran preparations. Moreover bran has a tendency to decrease the amount of digested food available for absorption by hastening its passage along the intestinal tract as well as affecting the digestive process itself.

Bran may be a source of danger in still another way.

Frequently persons, not finding any relief from constipation in the consumption of small amounts of bran, take larger quantities which are certain to prove a source of irritation. But probably the greatest disadvantage and harmfulness arises from the fact that bran does not tend to really correct intestinal atony, but it merely temporarily relieves it, and tends to aggravate it, since, as the intestinal muscles and nerves become more and more used to the increased bulk and irritation, larger quantities of the food must be consumed to stimulate peristalsis.

There are many preparations on the market such as agar-agar or Japanese seaweed that effect elimination through mechanical means. The effectiveness of agar-agar and similar products lies in their ability to absorb and hold in their porous structure large amounts of water, thus preventing the absorption of water by the walls of the intestines. They have but slight effect on the mucous membranes and nerve endings and therefore do not aggravate a tendency towards constipation. However, they have no corrective properties and therefore are efficacious only as long as they are used, and sometimes even cause intestinal obstruction.

Saline cathartics or salts, the various mineral water and aperient preparations act principally by causing an increased amount of water in the intestines. This increased amount of water is derived from the form of the cathartic itself which is either dissolved in water before consumption or is already dissolved in water when purchased, from the retention of water already in the intestine, and from the absorption of water from the blood vessels in the intestinal walls. This absorption of water is based on a principle which is

known in physics as the principle of osmosis—when two fluids of different densities or thickness are separated by a permeable wall such as the cell walls of our bodies, there is a tendency for the thinner fluid to flow toward the heavier fluid until they are both of the same density. The weight of the liquid, plus the stimulation of the nerve endings by the pressure against the intestinal walls causes the purgation.

In addition to this mechanical action which purgatives of this group possess, many of the patented preparations are intended to be definitely alkalizing by reason of the ingredients they contain, and not merely because they rid the body of the poisonous wastes which are directly or indirectly disturbing the acid-base balance. Some, too, are designed to have a specific effect on a particular part or parts of the alimentary tract, such as the liver, for example.

It is clear that salines, by causing the absorption of body fluid into the intestines, produce dehydration. It is for this reason that, particularly when insufficient water is consumed with them, individuals may become unduly thirsty. In certain constitutional disorders dehydration is often very desirable and even necessary, but in persons who are otherwise normally healthy it is neither desirable nor beneficial. The very fact that the system craves water and manifests this craving in the form of "thirstiness" is sufficient proof.

This group of purgatives has some other disadvantages which must be thoughtfully weighed when selecting a remedy for constipation. Because of the nature of their action, they must be taken when you are up and moving around, and they are far more prompt in action when some food is taken shortly afterwards—

preferably a light breakfast. (On the other hand, they cannot be taken shortly *after* a meal.) Hence they cannot be taken at night—and this is a serious source of inconvenience to many people. Nor can they be given to persons lying in bed if quick and thorough action is desired.

Moreover, if they are somewhat concentrated, salines remain in the stomach until sufficient fluid has been absorbed to make them the same density as the blood. During this time they irritate the stomach and the mucous membranes and the passage is delayed.

When they reach the small intestine they have an advantage, it is true, over purgatives of the cascara and castor oil type in that they do not affect the passage of the chyme—their action is principally ōn the large intestine. However, in some cases they produce nausea, headache and abdominal discomfort, even pain, without affecting the bowels. You yourself, if you have ever taken a purgative of this type —and undoubtedly you have—must have experienced at least a very uncomfortable, heavy feeling in your abdomen. If, in spite of this, you still indulge in salines—and they are useful at times—you must be doubly careful not to take more than enough for a single bowel movement, especially if you are suffering from hemorrhoids.

Keep in mind that this popular group of purgatives used under the guidance of a physician are exceedingly useful. But they are no more curative than the other remedies we have just discussed. Indeed, like them, they have a tendency to aggravate constipation. Moreover, it will be recalled that most of

this group have special alkalizing properties. Since it is very easy to become a victim of the salts habit, one is in danger of becoming over-alkalinized. Since the so-called acid stomach or acid indigestion is largely functional and is frequently caused by constipation, it stands to reason that in most cases the acidosis will disappear with the simple flushing of the intestines without the addition of drugs.

Liquid petrolatum in various forms and under various proprietary names still occupies a prominent place in the treatment of chronic constipation and similar intestinal disorders. It acts merely as a mechanical lubricant and increases the bulk of the intestinal contents to a certain extent. However, it does not increase peristalsis to any noticeable degree —in reality it merely makes more effective peristaltic action which is already existent. It is more valuable in conditions in which hemorrhoids or fissures are present or when some part of the passageway through the intestines has been narrowed.

In some emulsions of liquid petrolatum agar is added and it is claimed that the agar makes the product particularly effective. But this is misleading because there is not enough agar present to have any value and moreover, there is enough water in such preparations to nullify any possible benefit from the agar. Agar, it will be recalled, acts by absorbing and retaining moisture.

Mineral oils are of only temporary value and often increase intestinal sluggishness by lessening the amount of intestinal muscular exercise, although in cases of spastic constipation they are frequently

valuable agents as they decrease the irritability which is causing the constipation.

Not only are mineral oils of doubtful value in chronic constipation, but they have a tendency to interfere with digestion and assimilation. Moreover, they are apt to produce slight nausea, especially in persons whose stomachs are sluggish in their action and slow to empty. They have another disagreeable feature, too, of which many persons complain. If a sufficient quantity of oil is taken to bring about an evacuation of the bowel contents, the oil frequently leaks out from the bowel, since none of it absorbed, even to the extent of staining wearing apparel and bed clothing with an unsightly stain difficult to remove.

Chemically Acting Cathartics

Of all the remedies for intestinal ailments having a chemical action, we all would perhaps recall first, that old family standby, castor oil, and we would recall it with a shudder. Children of this generation certainly don't know how fortunate they are! Castor oil is absorbed principally by the small intestines and therefore its action on the colon is only indirect. Although it is occasionally spoken of as toxic, it is still accepted by most medical authorities as an excellent remedy in acute cases of gastro-intestinal disorders. Unfortunately, this age-old remedy has a most serious drawback. While it first purges the intestines, it lessens intestinal activity afterwards and actually increases the sluggishness from which relief is sought. Therefore if you are suffering from chronic constipation don't dose yourself with castor oil and

if some martyr complex or some other reason compels you to take it for an acute gastro-intestinal condition, be sure to follow it with a remedy which will remove the abnormal sluggishness caused by the oil.

Calomel is another time-honored remedy. Formerly it was believed that it acted on the bile, increasing its flow. It has been found, however, that it has no action on the liver but merely prevents the decomposition of bile. While at one time it was prescribed for nearly every kind of disorder, today it is rapidly falling into disuse because of its serious disadvantages. It is most uncertain in its action. In some persons it is valuable for certain acute conditions, it is true, but in others even a very small dose may cause severe poisoning which is extremely difficult to remedy as there is no method of quickly freeing the system of the mercury of which the calomel is composed. Never use calomel for chronic constipation as it is too irritating and may produce mercurial poisoning. And above all remember, it is never curative in its action.

Cascara is another chemically acting cathartic and one of the most popular ones as it is the least disagreeable to take and is almost free from discomfort. It has the disadvantage, however, of acting on both the small and the large intestines. Moreover, many of the pills and tablets containing this drug contain drastic cathartics. Therefore supreme caution must be exercised in the use of such preparations.

We could go on enumerating cathartics and pointing out their advantages and disadvantages, page after page—even book after book. But, while such a discourse might prove interesting to some readers, it would not prove any more valuable than the few

words we have spoken for the particular purpose at hand—the selection of the best way to cleanse the bowel and restore its normal, healthy tone. It is true, of course, that some are superior to others in effectiveness, after-effects and other characteristics, but they are all the same in that none of them are corrective in their action, that is, their effect is only temporary, lasting only when and as long as the remedy is taken. This is serious enough, but far more serious is the fact that the vast majority of them actually aggravate constipation by lowering the muscle tone of the intestines so that eventually they cannot perform any of their functions adequately. Therefore none of them should be taken in chronic conditions nor in any acute conditions where only the thorough flushing of the intestine is indicated.

As there is evidently no remedy either among the mechanically nor the chemically acting cathartics which meets our requirements, the reader has in all probability concluded that the solution is to be found in the group embracing the various forms of intestinal irrigation. He is right. But all methods of colonic irrigation are not equally beneficial. Indeed, some are only partially effective, while others may be even dangerous in the hands of an amateur.

Colonic Irrigation

Before examining the various forms of colonic irrigation or internal bathing, let us review the requirements of the apparatus and the method of its application.

First of all it must be simple and easy to use. The reasons are obvious. A complicated contraption re-

quires concentrated attention, for a slip-up in its handling would be disastrous. Naturally a person who is suffering from intestinal stasis does not feel like going through a lot of red tape. For that matter, most of the complicated mechanisms are designed to be used with the help of some other person, which is frequently embarrassing and inconvenient, to put it mildly.

In the second place it should be inexpensive. To pay a fancy price for a lot of shiny chromium gadgets is sheer folly. Such contrivances are often found in quack establishments and watering places which try to convince their patients that it is necessary to come to them for treatment since naturally the apparatus cannot be installed in the home.

In the third place, it must thoroughly flush the intestine of all the waste, and not just a part of it. And lastly—and this is by far the most important requisite—the cleansing should be of such a nature that the intestine is not injured either in functioning or structure, and should be so designed that the condition will gradually be corrected except in special cases in which extreme old age or extreme weakness due to chronic illness interfere when only amelioration of the condition can be expected. In other words, the treatment should aim to restore the proper muscular tone and functioning to the intestine the impairment of which has resulted in atonic constipation.

The J.B.L. Cascade is scientifically designed to give a self-administered Internal Bath which meets all these requirements.

In the following chapter a complete description of the appliance and the way to use it will be given.

Here we shall give only a brief outline in order to help us point out the superiority of the J.B.L. Cascade over other forms of intestinal irrigation.

The Cascade is, we have said, an appliance by which an Internal Bath of warm water in conjunction with a Cleansing Powder can be administered at home without the aid of a physician or nurse. The Internal Bath is taken by simply sitting on the Cascade. The weight of the body sends the cleansing solution gently to every part of the colon, flushing it and softening and removing the impacted fecal matter. The short injection point through which the liquid enters the intestine, is made with many perforations on the side instead of a single opening at the end. This is a special and unique feature—the liquid, instead of being injected as a harsh stream, is gently diffused. The flow is further regulated by a special faucet. The injection point is attached to a dome which fits the rectal arch, supports the rectum and aids in retaining the water. The J.B.L. Cascade has another great advantage. When it is filled it forms a large, warm cushion upon which the user sits. This imparts a soothing sensation and tends to allay the desire to expel the water prematurely. In addition, the body can remain covered.

The J.B.L. Cleansing Powder, to which we have referred, is especially designed to fulfill five important functions which water alone cannot perform. It tends to soften and dissolve to a greater degree the hardened masses of fecal matter clogging the intestines; to neutralize acid conditions; to soothe and help restore the tone of the membranes of the colon; to stimulate peristaltic action—that rhythmic, wavelike motion

of the colonic muscles which propels the intestinal contents towards the anus; and lastly, it tends to make the water a medicated, saline solution.

It is obvious from our brief description of the J.B.L. Cascade that it is far different from the ordinary low enema administered to oneself with the ordinary wall syringe. Indeed, practically the only similarity between the low enema and the J.B.L. Cascade is that water is used with both. The enema reaches only the lower portion of the colon—about one-third of its length, while the Cascade flushes the entire length of the colon, if it is so desired. It is rightly called the Internal Bath. This is partly due to the manner in which the Cascade is applied, but it is also due to its construction. Most enema bags hold but two quarts of water. The Cascade, on the other hand, holds all of five quarts of water. Since the normal colon has a capacity of about four quarts, it is immediately clear that the Cascade holds enough water to fill the entire colon—which the low enema does not.

It is usually necessary, when using the ordinary low enema to assume various awkward positions in order to secure results. With the Cascade, on the other hand, the user sits in a natural position on a warm, comfortable cushion. He is able to assume this relaxed sitting position because the dome, fitting against the anus, aids in retaining the water and makes it unnecessary for one to strain to hold the water as in the case of the wall enema. This relaxed sitting position allows a free, generous flow of solution to enter the colon. Furthermore, the hands are free to massage the colonic region if desired. Not only does

the sitting position allow a free flow of the solution into the colon, but because the colon is in its *normal* position, it makes it possible for the colon to be flushed its entire length.

The sitting position affords the Cascade another advantage over the ordinary low enema. In the use of the latter, the pressure of the flow of the water depends upon gravity. As the water in the bag becomes less and the resistance of the water in the lower portion of the colon becomes greater, a point may be reached where the pressure is insufficient to fill the bowel further. This is one reason why the enema usually reaches only about one-third of the length of the colon. With the Cascade, however, the pressure is always the same for it is proportional to the weight of the body bearing down upon it which is constant. This pressure is sufficient to fill the entire bowel.

The Cascade has another decided advantage over the enema. As you undoubtedly know, the rectal point of the enema has an opening which directs a single stream of water against one point of the colon. Very much as if you were playing a garden hose on a corner of a room, it hits the first bend of the colon, splashes around, and falls back again. The sudden, swift stream sets up a peristaltic action, thus creating a premature desire to expel. Naturally this makes it very difficult to hold the water. Herein we have another reason why the enema flushes only the lower part of the colon, and therefore does not give the best results.

But the Cascade point, with its many perforations in its side and no opening on the end, diffuses the

inflow, creating a slowly, gently rising body of water which reaches every portion of the colon, without any tearing force against a particular spot and without setting up a premature desire to expel. The Cascade dome, fitting against the anus, also aids in the retention of water. Instead of making an effort to hold the water by contracting the anus and thereby setting up muscular activity as does the ordinary enema, one is in a relaxed condition which permits the free inflow of the solution without a premature desire to expel.

The handle of the Cascade, too, helps to regulate the flow. Indeed, it affords a perfect control of the rapidity of the inflow. It turns on and shuts off the solution in an easy, positive manner. The enema, on the contrary, depends upon certain finger pressure and unruly clamps.

Just as the J.B.L. Cascade has advantages over the low enema, it has advantages over high colonic irrigation. As the term implies, high colonic irrigation refers to the washing out of the lavage of the large intestine. It is not administered with the sole purpose of inducing defecation, as the low enema is, but to wash out the matter lodging above the defecation area and to cleanse the walls of the bowels as high as the water will reach. Hence it is sometimes called the "glorified enema". In that it is used to cleanse out the entire bowel, it resembles the J.B.L. Cascade. But there the resemblance stops, for in construction, technique of administration and final results, it markedly differs.

While recently methods involving the use of a single shorter tube or two shorter tubes have been

advocated, by the ordinary method a long tube is passed up through the colon directly into the cecum. Such a tube necessarily would be four feet in length or longer. The disadvantages are only too obvious. First of all it requires skilled hands to push the tube up the bowel. This involves a considerable expenditure—and usually unnecessary expenditure of money. It may also involve considerable waste of time and energy since the patient frequently has to leave home for treatment. At any rate, the mere fact that such an irrigation must be administered by some one else entails a certain amount of embarrassment.

Even if applied by a very skilled person, the ordinary high colonic irrigation involves a certain amount of danger. Since the intestine cannot be seen while the tube is being passed through it, it is impossible to know exactly where the tube is going. Moreover, unless the tube is quite stiff—and even then—it is apt to coil up in the rectum instead of passing on to the cecum. And if the tube should be stiff and firm enough not to coil or kink, it is most likely to be hard enough to injure the delicate tissues lining the intestine. The use of the opaque enema in roentgen or x-ray work has demonstrated beyond a doubt that with the use of a short tube water, under the proper pressure, will reach the cecum in a very few minutes.

Since the sides of the long tube used in the ordinary high colonic irrigation are not perforated, only that portion of the colon beyond the long tube is medicated. The portion of the colon where the tube is receives practically no treatment, yet this is the part which usually requires the treatment the most.

On the other hand, with the specially designed short

point of the J.B.L. Cascade, without the least possible danger, a column of the solution is maintained in direct contact with every portion of the colonic wall.

Now that we have reviewed the various treatments for constipation, let us look back in retrospect at our findings. We set out, you will recall, to find the safe, agreeable, convenient, economical way to prevent, relieve and correct atonic constipation. First of all we reviewed the mechanical laxatives, including both the food types and the medical types. While this group has many merits, and under certain conditions it might be advisable to use them, they frequently prove irritating and are not corrective. Quite the contrary, they often have the opposite effect, weakening instead of toning up the intestinal muscles and thus tending to be habit-forming.

Next we reviewed the chemically acting group of cathartics, only to find that they, too, failed to meet our prerequisites of an intestinal flusher. So, by the process of elimination we arrived at the conclusion that our remedy must be found among the various forms of colonic irrigation. In comparing them—the low enema, the high colonic and the J.B.L. Cascade, we found that the J.B.L. Cascade used in conjunction with the J.B.L. Powder best fills all our requirements.

The J.B.L. Cascade is pleasant to use, convenient and economical and can be administered in privacy by one's self. And above all it is effective. By effective we do not mean that it merely relieves atonic constipation. The Cascade Internal Bath is a treatment designed to assist you in trying to correct the abnormal condition and to encourage the normal functioning of the colon.

In the chapters in which we discussed the structure and functioning of the alimentary tract and the causes and symptoms of constipation, we have given you a word picture of how the large intestine works, both in a healthy and in a sickly condition. Normally, you will recall, the intestine works by squeezing in or contracting the bands of muscle surrounding the flexible tube. This action, coming in wavelike motions called peristalsis, passes the debris onward towards the anus from which it is finally expelled. Modern foods—in fact, modern life as a whole—causes solid, impacted food debris to clog the intestines, thus preventing the contraction or squeezing in of the bands of the muscular fibers and thereby weakening them through lack of proper exercise. The J.B.L. Cascade Internal Bath does for you, living in this modern, over-refined civilization, exactly what coarse, fibrous foods do for primitive folk. It makes the waste matter so loose and semi-fluid, so large in bulk, that the muscles perform their natural work easily and thereby gain strength through proper exercise. The expulsion of the water medicated with the Powder, together with the accumulated waste, is accomplished entirely through the normal, natural action of the muscular bands. You do not strain. The muscles contract automatically, being stimulated and exercised by the medicated water.

It is because of these unique advantages of the J.B.L. Internal Bath that the need for its use becomes less and less frequent as the strength of the intestinal muscles is improved, and they become more able to do their work unaided.

Therefore, under the conditions of our modern life,

we can recommend the use of the J.B.L. Cascade Internal Bath, in all honesty and sincerity, whenever you feel that you need a "cleaning out." And in the next chapter we shall tell you how to use the J.B.L. Internal Bath.

CHAPTER XV

HOW TO USE THE J. B. L. CASCADE

Sometimes the infrequent detractor of the practice of Internal Bathing through the use of the J. B. L. Cascade contents himself with uttering the generality, "Oh, it's so complicated to use."

The J. B. L. Cascade is very simple to use—as simple in its operation as it is effective in its results.

However, one should follow the directions as set forth in this chapter, directions which have been carefully and scientifically worked out and, furthermore, tested as to their correctness and efficiency by thousands of J. B. L. users.

Obviously the most convenient place in which to use the Cascade is the bathroom or toilet. A hard-seated wide chair or other firm, flat surface, such as a bench, chest or top of toilet seat, is necessary upon which to place the rubber bag. Do not attempt to hurry the operation of using the Cascade. "Be patient with thyself"—as the old injunction says, and follow at all times the simple directions herewith appended. But first study them carefully because in so doing *you will learn the precise physiological reasons why the J. B. L. Cascade produces such beneficial results in the treatment of constipation and auto-intoxication.* "Once having learned the truth, no man can ever after be deemed anything but wise."

Having thoroughly rinsed out the rubber bag with warm water, close the faucet. Dissolve a level tablespoonful of the J.B.L. Powder in a cupful of boiling water and pour it into the bag, which should then be *completely* filled with water as warm as the bare hand or elbow can comfortably bear when it is wholly immersed. If tested with a thermometer the water should be 100 degrees F. Warm water is one of the best solvents for impacted fecal matter. Besides, water below the temperature of the body may sometimes cause pain.

It is absolutely necessary to fill the bag completely, in order to exclude all air, which otherwise prevents the proper reception of the water. Before taking the treatment, it is advisable to attempt to evacuate the bowel (without straining), because, even if no fecal matter is expelled, pent-up gases are frequently liberated.

When the bag has been filled, the Cascade should be placed flat, as directed, upon a convenient, firm seat; the injection point should then be screwed into the dome and liberally smeared with the J. B. L. Lubricant. In addition, thoroughly lubricate the first or index finger, insert it gently into the anus, and keep it there until the sphincter muscles relax. A slight spasm of the external and the internal sphincters of the rectum is natural, but in nervous or constipated persons often it is unduly pronounced; and the purpose of leaving the well-lubricated finger in the rectum for a few seconds is to enable the rectal tissues to relax.

When all is thus ready, pass hand between the legs and, holding the handle of the faucet,

guide the "injection point" into the rectum. Then carefully lower the body down upon the bag, until the "injection point" has been completely introduced and you feel comfortably seated and completely relaxed allowing the full weight of the body to rest on the bag. The reason for this is shortly explained.

Turn on the faucet, partly at first, then fully. It is essential to take just enough water (about a pint), to fill the sigmoid and the descending colon, thus to create first a reverse spasm of bowel expulsion. When you feel this spasm, rise from the Cascade and evacuate the bowel immediately. If necessary, again take about the same quantity of water, and at about the same temperature. This preliminary emptying of the lower bowel is most important and a little experience will soon prove how easily it is done.

When this has been done, after one, or possibly two attempts, you should then sit with the full weight on the bag. Turn on the faucet (as before), then the water will pass very quickly through the sigmoid, up the descending colon, round the splenic flexure, into the transverse colon, and eventually into the cecum. The reason for following exactly the sequence of procedure, as just explained, is so as not to force fecal matter, already in the sigmoid and descending colon, back into the transverse colon or cecum. At the time of receiving the water, proceed with the following movements: Starting at the lower left side of the abdomen gently massage the abdomen up, then across just above the navel, and down to the right groin, and

thus around in a circle. These movements are directly over and along the course of the colon, and if they are made gently but firmly, the water will be assisted on its course. A study of the diagram of the digestive apparatus in the front of the book will be of great assistance in enabling you to understand the reason for and the method of these movements; but, of course, this must not be done during the preliminary flushings of the rectum, sigmoid and descending colon.

As soon as all the water has entered that you feel is comfortable to receive, turn off the faucet, rise from the Cascade, sit over the toilet and allow the bowel contents to escape. At the same time, repeat the massage movements described above, this time reversing the procedure; that is, beginning in the right groin, etc. These movements have a three-fold object: they assist the water in its passage backward and forward, thus shortening the time of the treatment; they force along the accumulated matter in the colon with the current of water, and help to dislodge adherent matter from the walls of the colon.

After the bowel has evacuated completely, lie flat upon a bed or couch, with the hips elevated slightly higher (four or five inches) than the shoulders, then again repeat the encircling massage of the abdomen, first one way and then the other, as described above. This will help the bowel to retract.

If pain is present during the treatment, it is usually due to one of two causes: either the water has not been sufficiently hot, or the bag has not been com-

pletely filled. If, however, pain is felt while the full weight of the body is on the Cascade, the user should shut off the water immediately and evacuate. Sometimes it is advisable to take more water, but if one feels discomfort to any marked extent, it is better to wait twenty-four hours before taking another injection. If pain is persistent, even though all precautions are taken, we advise you to communicate with us for further instructions. However, cases of persistent pain while using the J. B. L. Cascade are extremely rare. Once the technique of using it has been fully mastered, no untoward results need arise.

The reader should study the diagram of the digestive organs at the beginning of the book, and realize that the purpose of any Internal Bath is to clear the entire large bowel of fecal residue. Now, the large bowel varies with the individual; and sometimes there are constrictions, saculations and pouches which must be helped in returning to normal bowel motility, or rhythmic peristalsis—that is to say, normal automatic functioning.

The J. B. L. Cascade has proved to be the best instrument for home high colonic usage but before using it, one should thoroughly understand that water should not be permitted to go beyond the sigmoid and descending colon, until this part of the bowel has been completely washed out—relieved of all fecal residue. The sigmoid (that part of the bowel just above the rectum) is often considerably dilated, pouched and consequently gravitated. The descending colon is that part of the bowel just above the sigmoid, and leading up to the splenic flexure where (see diagram)

the bowel then turns to the right, and forward, forming the beginning of the transverse colon.

Quite a small quantity of water will fill the sigmoid and the descending colon and create a natural reverse spasm (or "desire") of the bowel expulsion; but if too much water, *at first,* is admitted, abnormal distention may ensue. For instance, abnormal distention of the rectum or the sigmoid may cause constriction of the descending colon just above. Moreover,—and this is still more important—it is essential that no fecal (and perhaps, actively poisonous) matter already in the sigmoid and descending colon be forced backward into the transverse colon or the cecum.

Then, if too much water, *at first,* is admitted, both the scientific application and the benefits of the treatment are not fulfilled. And that is why so much attention is paid here to the procedure for the primary flushing of the lower bowel. It is wise to repeat the preliminary flushing, in order to make quite sure that the lower bowel is thoroughly washed out.

The frequency with which the treatment is used will depend upon the nature of the trouble and the length of time it has existed. Generally we recommend the following plan: During the first week the Cascade may be used every night; during the second week on every alternate night; thereafter intervals between treatments may be gradually lengthened.

The Cascade should *not* be used *within three hours after eating a full meal;* because if both the stomach

and the transverse colon are distended at the same time, they press against each other; and since the stomach is the more sensitive of the two, nausea is probable. With this proviso, the treatment may be applied with benefit at any time during the twenty-four hours; although just before retiring at night is by far the best time to take it, for several reasons. First, it is usually the most convenient time. Secondly, it invariably induces a good night's rest—for no sleeping potion can equal the soothing effects of this scientifically-correct Internal Bath. Thirdly, night is Nature's repairing season, when she is busy making good the ravages of the day—replacing the waste by building fresh tissues, and by putting the system into a cleanly condition and purifying the blood current.

After using the Cascade, it is quite possible that there may not be a movement of the bowels until late in the following day. This must not be considered as evidence of constipation, but simply of a lack of matter to discharge. In a perfectly natural existence there should be at least one or two movements of the bowels during the day, but it must be remembered that owing to the ever-increasing demands of civilized life, the human system has acquired bad habits, and therefore, some time must elapse before normal conditions are re-established. If, however, from a half-pint to a pint of hot salt water (a teaspoonful of salt to one pint of water) is sipped half an hour before breakfast, it will stimulate the bowels to action, even though the Cascade has been used on the night before; and its cleansing effect upon the stomach and the small bowel will help the digestive functions in a marked degree. If the salt water is unpalatable, it is equally advan-

tageous to sip one or two glasses of hot water, into which the juice of half a lemon has been squeezed.

It must be realized that we live a more or less artificial life. In his barbaric state, man obeyed the calls of nature without regard to time or place; and it is safe to assert that in those conditions an obstructed colon was an almost unknown quantity. But in deference to the demands of civilized life we disregard nature's calls and defer the response until a convenient opportunity presents itself. An obstructed colon, therefore, being itself unnatural, man, with intelligent deduction, is obviously justified in devising a means whereby the colon may be thoroughly cleansed.

Common sense and experience combine in teaching us that the Internal Bath through the use of the J. B. L. Cascade is not only the easiest, but the most effective means of cleansing the colon; and undoubtedly it must be entirely harmless, since in the process we use nature's most simple and effective cleansing agency—pure water. Sickness itself is unnatural; and in order to restore the system to its natural condition, reason plainly shows us that we must cooperate with nature in removing impurities from the system—a task which our disregard of her warnings has prevented her from accomplishing unaided. Cathartics merely excite and spur the excretory processes. This unnatural exertion is followed by a feeling of languor, for all purgative action is debilitating. Besides, the constant use of drugs is a primary cause of pouching or sagging of nearly every part of the large bowel, and even the terminal ileum, which is the first part of the small bowel just beyond the cecum.

The Internal Bath, on the contrary, acts directly

on the accumulated fecal matter in the colon; and, instead of causing an unnatural excitation of any of the natural processes, it induces a sense of profound relief and content.

Remember, too, that in many instances various medicines and nostrums are swallowed to aid the stomach, when the root of the real trouble lies in the colon.

It has been stated that the practice of washing out the colon is debilitating. We have the evidence of many thousands of people to the contrary—people who have tested the treatment. *Personal* experience is always more to be relied upon than unsupported theory. Many doctors, moreover, whose patients have practiced internal bathing regularly, will testify to its invigorating effects.

And, to the objection that the Internal Bath weakens the intestines, we reply—in well-known fact—that at least fifty per cent of people in civilized communities are slaves to the purgative habit, because they have found that the system refuses to fulfill its normal functions without this unnatural excitation. If, therefore, dependence must be placed on something, we should unhesitatingly give preference to water, rather than to cathartics. But the main weight of medical evidence proves that this objection has no foundation.

On this subject, Dr. Forrest said: "Flushing the colon does not cause weakening of the intestines. When this procedure is no longer necessary, owing to better physical conditions, the intestines have also been strengthened and improved in tone and will carry on their functions unaided."

It may also be contended that the frequent use of

the Internal Bath will so stretch the colon that it will remain permanently distended. *This cannot possibly take place, if the instructions outlined in this book are closely followed.*

The veriest tyro in exercise knows that exercise develops a muscle; that repeated flexion and extension of the arm, for instance, will strengthen the muscles of that limb, not cause them to lose their contractibility. All muscle fibres are alike in their physical response to exercise, except that some are voluntary, others involuntary. No reason can be shown why the muscles of the colon should lose their elasticity through exercise, contrary to all the other muscles of the body. During the Internal Bath they are not subjected to any extraordinary strain; such tension as there is only lasts for a few moments; and as soon as the water begins to escape, relaxation follows. Moreover, the pleasant, soothing heat acts as a stimulant.

Again, it might be contended that the Cascade operates against peristalsis (the rhythmic, longitudinal and circulatory contracting wave of the bowel muscles). We deny this emphatically; for the energy shown by the intestine in expelling the water is proof of *increased peristaltic vigor.* And even if the Internal Bath did suspend peristalsis for a few moments, is it not the fact that other natural functions can be suspended for a much longer period, only to be resumed with unabated vigor?

Still another unreasonable objection sometimes is advanced, that the washing of the interior surface of the colon is injurious—because it washes away the fluid (mucous secretion) that nature secretes for the

purpose of lubrication. By the same argument, one might say that bathing the external surface of the body prevents further excretion of perspiration; or that bathing the eyes destroys the functions of the Meibomian glands; or that the drinking of water prevents any further discharge of saliva into the mouth, or of gastric juice into the stomach! If washing away of a secretion destroyed the power of the secreting gland, human existence would be brief indeed.

The truth is that very few people really understand anything about the bowel; and experience has proved and will continue to prove, that scientific (and common-sensed) colonic irrigation, as accomplished by the use of the J. B. L. Cascade, can only be healthful.

How long the treatment of the Internal Bath should be continued will depend upon the nature and the habits of the patient. If the pernicious habits that caused the trouble are not abandoned, a constant resort to the Cascade will be necessary. If a patient is naturally of a costive habit, and has thoroughly weakened his intestines by an indiscriminate use of cathartics and improper diet, long persistence in reformed habits will be necessary before the weakened bowels gain sufficient strength to fulfill their functions normally.

Often, it is advisable for elderly people to use the Cascade at regular intervals; because, with advancing years, the bowels naturally become less active, and this simple process offers valuable assistance to flagging nature, and at the cost of little, if any, exertion.

We would strongly impress on the minds of those who propose to give the Internal Bath a trial that, like every other undertaking in life, thoroughness

and persistence are indispensable to success; they are necessary if the patient would restore to the bowel a condition from which, perhaps, it has long been estranged.

Perseverance in the treatment and rules of hygiene outlined in previous chapters will frequently achieve results that seem startling to those accustomed to the usual "hit or miss" methods employed in the treatment of constipation.

APPENDIX

WHAT TO DO IN ACCIDENTS

In accident prompt "first aid" for a slight injury may often prevent a serious one, or save life.

First aid is not intended to take the place of a physician's services. Whenever there is a serious injury, a doctor should always be summoned. There are times when a few minutes' delay may mean the loss of a life.

To give first aid, first examine to decide what must be done, and to see if the injuries are serious. If conscious, this is easily ascertained. If unconscious, the nature of the accident will decide the seriousness. If in no danger, a more careful examination should be made as to location and nature of the injury. Make sure that no bones have been broken before moving. Often a glance will show. Undo the clothing to determine the amount and source of bleeding.

If unconscious, note the color of face, and condition of skin, manner of breathing, nature of pulse and pupils. If bleeding is rapid stop it before making further examination. If not sufficient to place in immediate danger, proceed along these lines:

Make comfortable until a doctor arrives. Give messenger a complete description of the nature and extent of the injury. If in a dangerous place or exposed to severe weather, move, taking all possible precautions to avoid increasing the injury, especially if there are broken bones.

Loosen tight collars or belts. Keep lying down or resting comfortably in a sitting position. Lower the head and let lie horizontally for pale face. If the face is flushed, raise head on a folded coat. If vomiting occurs, turn the head to one side. Do not try to force unconscious persons to drink water or stimulants they cannot swallow.

In removing clothing, take off from the sound side first, and avoid the danger of disturbing a fracture. Cut clothing up the seams when necessary to examine an injured or crushed limb. Check all hemorrhages before attending to anything else. Keep warm (of great importance) and allow sufficient air. Keep the crowd back.

FIRST AID KIT FOR THE HOME

The following supplies should be included in the camp, home and first aid kit:
Aromatic spirits of ammonia, 2 oz. with a rubber cork.
Antiseptic gauze, 4 small packages; absorbent cotton, ½ lb.
Roller bandages, 8 (4 large and 4 small).
Iodine swabs (12) and Carbolized vaseline, 1 jar.
Pins, ordinary and safety; scissors, blunt and curved.
Olive oil, 4 oz., lime water, 8 oz., and Mustard, 4 oz.
Glass and spoon and Camel's hair brushes, (2).

Shock may be due to severe bleeding, abdominal injuries, fractures, burns and scalds, excessive cold, gun shot wounds, severe cuts and bruises.

Those suffering from severe shock lie in a drowsy condition but not totally unconscious. Limbs are limp and skin pale and cold; temperature below normal and barely noticeable; breathing shallow; often severe thirst, especially if caused by bleeding; usually accompanied by vomiting and hiccoughs. Shock is usually recoverable but in severe cases, death may result, as in extensive superficial burns of children or the aged. Shock may not be severe enough as to include all the symptoms mentioned. Unless slight, send for a doctor. Heat, position and stimulants are the first aid remedies.

Heat is the most valuable. Electric pads, hot water bags, and glass bottles are good. Hot bricks and flat irons are also useful but use so as to prevent burns. Test and cover with protective layers of cloth or paper. In applying, place between legs, at outer sides and between body and arms. A hot water bag over the heart acts as a special stimulant. Loss of body heat always increases shock. Never remove more clothing than is necessary. Rub the limbs toward the body. Place on back with head low so that the blood will run toward brain. Raise the feet. Never raise head. The best first aid stimulant is aromatic spirits of ammonia, a half teaspoonful in one-half glass of water, preferably hot. Other good stimulants are hot black coffee, hot tea, or hot water. Repeat in half an hour. Whiskey and brandy are injurious. Never give an unconscious person stimulant by the mouth. Aromatic spirits of ammonia, ordinary aqua-ammonia or smelling salts may be used. Strong ammonia should be diluted with water. An inhaled stimulant is particularly useful for the unconscious, because they are unable to swallow.

A severely shocked person should not be moved until recovered to some extent. First aid should be given before moving. Clothing should be loosened at neck, chest or abdomen during transportation. Do not remove clothing, as it increases shock. All serious cases should be carried on stretchers, which

can be made with two or three coats and a pair of poles. Turn coat sleeves inside out and place on the ground with the lower edges touching. Pass the poles through the sleeves on each side and button, with the buttoned side turned down.

In carrying the patient up hill, follow these rules: *Feet first:* After severe bleeding, fracture of lower limbs, fainting, shock, or if face is very pale. *Head first:* In cases of apoplexy, sunstroke, fracture of the skull, or if face is flushed. Keep stretcher as level as possible.

If able to sit up and steady himself by placing his arms around the bearers' necks, carry in the "lady's chair". Each bearer should grasp his left wrist in his right and the other bearer's right wrist in his left hand, knuckles uppermost. Then stoop and place the chair under person who steadies himself by placing his arms around their necks.

TO PREVENT INFECTION OF WOUNDS

Severe wounds may cause considerable damage to the muscles, bones, blood vessels, or internal organs, with possibility of severe inflammation. Danger of infection exists, therefore all wounds must be handled carefully. Even a pin scratch has been known to result in death.

Heat kills bacteria. All dressings, instruments used in dressings, should be first heated, by boiling. If wound is deep, or of a considerable surface, send for a doctor. Look out for shock and treat. Do not touch the wound. Exposure to the air is much safer than application of anything which is not *surgically clean.* Apply a sterile dressing at once, and bandage firmly in place.

Water, unless boiled is apt to contain germs. Too strong a solution of mercury or carbolic acid will destroy the body cells which dispose of the pus germs before they kill the latter and should never be used. Hydrogen peroxide is not strong enough. Iodine is of value, if applied in a 3% solution immediately and not later than two hours after injury is received.

Never pour it into a wound. Use a camel's hair brush or a tuft of cotton on a stick. Never suck a wound, as dangerous pus germs are always in the mouth. Squeeze well at the sides. Adhesive plaster is unsafe. With much bleeding put on a layer of absorbent cotton over the compress (pad) before bandaging. A first aid packet should always be used in preference to anything else. The next best is antiseptic gauze. If at all serious call a doctor. Always examine the article which inflicted the injury to determine if the end may have broken off in the wound.

While waiting for the doctor, twist a small amount of cotton around the end of a toothpick, dip in iodine and push down

to the bottom of the wound and work the iodine thoroughly into it. Paint surface and apply a sterile dressing.

In bleeding or hemorrhage the blood is carried through the body by three blood vessels, which are divided into (1) arteries, (2) capillaries, (3) veins.

The most dangerous form of bleeding is when an artery is cut and red blood spurts. Unless checked promptly patient will bleed to death. This can be stopped temporarily by pressure on the artery between the cut and the heart, until a tourniquet can be improvised. In all cases of severe bleeding, secure a doctor at once, but do not delay treatment.

In a cut artery, remember the flow of blood is away from the heart and that it is necessary to apply pressure between the cut and the heart. PRESS ON THE ARTERY ON THE NEAR OR HEART SIDE AS CLOSE TO THE BLEEDING POINT as possible. In pressing it is necessary to select a point where a bone will give a hard surface to press against.

When a vein is cut there is a continuous flow instead of in spurts. Venous blood is a dark bluish red color easily distinguishable from the bright red arterial blood.

In *wounds and severe bleeding,* first check the bleeding. Lay patient down, raise wounded part and keep the head low so that brain will get as much blood as possible. Prevent violent movements. When bleeding has ceased, the injured person should remain quiet. Give plenty of fresh air, cover warmly and put hot water bottles around. Stimulants are undesirable. Do not give them until bleeding is checked.

In a state of collapse from loss of blood, death may often be prevented by forcing the blood into the body from the limbs, by raising feet and bandaging legs from toes to body and arms from tips of fingers to arm pits with roller bandages.

For *slight burns,* exclude air by thin paste of water and baking soda, starch or flour. Ordinary vaseline or carbolized vaseline, olive oil, fresh lard or cream may be used. Smear over burn and on cloth to cover it. Hold dressing in place with light bandage. In second and third degree burns, a doctor should always be called, as there is severe shock and pain. In removing the clothing care should be taken as the clothing is apt to stick to injured surfaces. Cut it away. The portions which remain fast may be softened later, with oil or warm water and carefully removed.

Acid burns should be washed under flowing water and neutralized with an alkali, or solution of baking soda or soap suds. Lime water is excellent. For acid in the eye, wash out as quickly as possible with water and follow with lime water or bicarbonate of soda. For carbolic acid burns, pour on alcohol freely. Wash off *alkali burns* as quickly as possible under running water. Neutralize with vinegar, lemon juice or cider. Eye burns should be washed with a weak solution of vinegar

and water or olive oil. Treat like other burns. In severe burns always see doctor, particularly when it is an eye case.

Great caution should be observed in approaching one who has received an electric shock and is still in contact with a live wire. Do not touch with bare hands. Rubber gloves are the best protection. Take hold of the coat or skirt with hands inside of sleeves of a coat and remove from the wire with a quick jerk, use rubber overshoes or rubber raincoat to insulate the hands. If the ground is wet, stand on a dry board or newspapers. If the wire is lying on the victim, brush away with a dry stick. Never use a wet stick or anything made of metal. Don't approach closer than 18 inches. When clear of wire start the prone pressure method of resuscitation at once. Delay may mean death. Electrical burns require a doctor. In the meantime use the first aid methods for burns.

In *heat exhaustion* send for a doctor. Remove patient to a cool place and lay down in a comfortable position with clothing loosened. Do not apply cold externally, give small quantities of cold water. Stimulants such as tea, coffee or aromatic spirits of ammonia should be given. Keep up bodily warmth.

For *frostbite and freezing,* rub frozen part with snow or cold water. Then use warm water gradually. Never apply heat immediately. It may result in mortification of the frozen part. In freezing, a condition similar to a local frostbite prevails over the greater part of the body. To treat take into a cold room, rub limbs toward body with cloths wet in cool water. Increase temperature of room gradually. Cloths should be wet in warmer and warmer water. As soon as conscious and can swallow give aromatic spirits of ammonia in water, or tea or coffee. It is dangerous to place before open fire or in hot bath until patient begins to recover. Increased pulse, better breathing and more warmth and color in skin show recovery.

Often a *bruise* is the least serious part of an injury. Make sure that there is no other injury, as broken bones. Bruises of the chest and abdomen often accompany internal injuries. These severe bruises require the immediate attention of a doctor. If shock is severe after a bruise of the abdomen or chest there is serious danger of internal injuries.

A handkerchief wrung out in ice water or an icebag should be applied immediately in *black eyes.* The ice water constantly renewed, thus combining the effects of both cold and moisture. Keep up for an hour. It will prevent discoloration. If the flesh has become black, applications of hot water for half an hour, three times a day, are good. If there is pain, see a physician to make sure that there is no eye injury.

Wash *blisters* thoroughly in hot water, pass a clean needle through a flame and prick at the side, gently pressing out the fluid until flat.

For *strains* use rest, and gentle rubbing with alcohol and

water, equal parts, arnica, liniment or witch hazel. The rubbing should be vigorous. Later hot water bags will often give relief. When the pain is reduced, gentle movements should be practiced. Always call a doctor when severe or in doubt. Begin treatment at once. Rest in order not to do more damage by rubbing the injured joint surfaces together. Less blood will come to the part if elevated. Application of heat or cold will contract the blood vessels and limit the escape of blood. Cloths wrung out in very hot or very cold water should be applied. Place injured part under a cold or hot water tap. Use hot instead of cold water for children, or old people or when there is shock. Either heat or cold should be applied long enough to get the full benefit, that is 24 to 48 hours. A severe sprain, especially of the ankle, requires a physician. Under X-Ray they often prove to be fractures.

Do not try to put a dislocated joint back if a doctor can be reached. Cover with cloths wrung out in very hot or cold water. Apply pad under armpit and put arm in wide sling. Dislocation of the second joint of the thumb requires a doctor. Others are less difficult. A dislocated finger should be grasped firmly on the hand side. The end of the finger can then be pulled straight out away from hand and bone will usually slip into place.

If cinder or any other object gets in the eye, avoid rubbing as it drives the object more deeply into the eye or lid and makes it harder to remove. First close the eye so that tears will accumulate and the object will be washed out or loosened and easy to remove. If this fails, turn up lid carefully over a match or toothpick and brush across it carefully with the corner of a clean handkerchief, or absorbent cotton. If this fails, see a doctor.

If a small object becomes wedged in ear, care must be taken not to push it in farther by awkward attempts to remove. Tweezers may succeed, otherwise see a doctor.

Children often get peas or beans in their noses. Try to dislodge by having them blow through the nose with the other nostril closed. If this fails, call a doctor before any swelling occurs, which will make removal difficult.

POISONING

In carbolic acid, creosote, lysol and sulpho naphthol cases, give epsom salts, castor and olive oil, three or four eggs or alcohol which neutralizes it.

In corrosive sublimate (mercury, bichloride) give freely of whites of egg, beaten up in water, and then empty stomach and repeat the eggs.

For iodine cases give starch and water, bread and water, empty stomach and repeat milk, white of egg and stimulants.

Lye, caustic potash, caustic soda and ammonia cases, give olive oil followed by vinegar and lemon juice.

Ptomaine cases:—Any emetic such as mustard or salt water. When stomach is empty large dose of castor oil and strong coffee. Keep warm and avoid food until recovery.

Phosphorus, matches, rat poison:—Avoid oils, give emetics, clean out stomach, then give magnesia or chalk, and mucilaginous drinks.

Toadstools:—Give emetics, castor oil, cathartics, stimulants, external heat.

Wood Alcohol:—Use emetics and apply heat over heart and to hands and feet. Give strong coffee, inhale ammonia, and call a doctor.

Lead, paints, etc.:—Empty stomach; give tablespoonful Epsom or Glauber salts in glass of water, raw white of egg and castor oil.

Arsenic, Paris Green:—Give emetics at once; then 4 ounces hydrated oxide of iron and magnesia at one dose. Raw eggs, beaten up in sweet milk, freely followed by sweet oil. Keep extremities warm and use stimulants. Magnesia may be used.

A Selected Bibliography

The following list of books and articles was compiled from the writings consulted in the preparation of THE ROYAL ROAD. It is not to be regarded as a complete reference list, but rather as a guide for further reading. For this reason, as much as possible, those works which are available at the average medical reference library, were selected. As many of the references contain a discussion on more than one of the topics treated in THE ROYAL ROAD, they are listed in alphabetical order and not according to subject matter. The title of the reference, in most cases, clearly indicates the subject.

Aaron, Harold. "An Answer to the Question, What Laxative to Use." *Consumers Union Reports.* March, 1937, pp. 19-23.

Alasker, R. L. *Curing Catarrh, Coughs and Colds.* New York, 1917.

Alvarez, W. C. *The Mechanics of the Digestive Tract.* New York, 1928.

Alvarez, W. C. et al. "Hypertension and Constipation." *Archives of Internal Medicine,* Aug., 1926, p. 158.

Anderson, E. D. "Gastro-Intestinal Symptoms Occurring with Upper Respiratory Infections in Infancy and Childhood." *Minnesota Medicine,* Feb., 1936, p. 106.

Arafa, M. *Modern Aspects of Gastroenterology.* London, 1933.

Atchley, D. "Blood Changes in Intestinal Obstructions." *New York State Journal of Medicine,* Oct., 1933, p. 1911.

Aykroyd, W. R. *Vitamins and Other Dietary Essentials.* London, 1933.

Balyeat, Ray M. "Allergic Dermatitis." *Journal of Allergy,* Sept., 1930, p. 516.

Balyeat, Ray M. "Cosmetic Dermatitis." *Northwest Medicine,* Jan., 1935, p. 12.

Barker, J. Ellis. *Chronic Constipation, the Most Insidious and the Most Deadly of Diseases.* London, 1927.

Bassler, A. "Alimentary Toxemia." *Archives of Physical Therapy,* March, 1937, p. 162.

Bassler, A. "Chronic Intestinal Toxemia; Short Presentation on Author's Method with a Few Opinions." *Medical Record,* Feb. 17, 1937.

Bastedo, W. A. "Chronic Constipation." *Medical Clinics of North America,* Nov., 1936, p. 891.

Bastedo, Walter A. "Colon Irrigations." *Journal of Nursing,* June, 1936, p. 565.

Bayliss, Sir William M. *Principles of General Physiology.* Philadelphia, 1924.

Bethea, O. W. "Use of Cathartics; the Pharmacopeia and the Physician." *Journal of the American Medical Association,* Oct. 17, 1936, p. 1298.

Boas, Ismar. *Habitual Constipation.* New York and London, 1923.

Bogert, L. Jean. *Diet and Personality.* New York, 1934.

Bogert, L. Jean. *Nutrition and Physical Fitness.* Philadelphia and London, 1931.

Bolton, Edward R. *Oils, Fat and Fatty Foods, with a Chapter on Vitamins* by J. C. Drummond. London, 1928.

Bradley, A. V. *Tables of Food Values.* Peoria, Ill., 1931.

Bray, G. W. *Recent Advances in Allergy.* London, 1934.

Bridges, Milton A. et al. *Dietetics for the Clinician.* Philadelphia, 1937.

Bridges, Milton A., and Mattice, Marjorie R. *Food and Beverage Analyses.* Lea and Febiger, Philadelphia, 1942.

Burton, Alan C. "A New Technique for the Measurement of Average Skin Temperature over Surfaces of the Body and Changes of Skin Temperature during Exercise." *Journal of Nutrition,* 1934, p. 481.

Campbell, C. M., and Detwiller, A. K. *The Lazy Colon.* New York, 1928.

Cannon, Walter B. *The Wisdom of the Body.* New York, 1932.

Carles, Jules. "Les Vitamines." *Etudes,* Paris, March 5, 1935, p. 623.

Carlson, A. J. *The Control of Hunger in Health and Disease.* Chicago, 1916.

"Character and Soap." Ed., Louisville *Herald-Post,* cited in *American Journal of Physical Therapy,* Nov., 1928.

Chiray, M. M., et Stieffel, R. *Les Constipations.* Paris, 1933.

Cleanliness Institute. *The Book About Baths.* New York, 1930.

Clendening, Logan. *The Human Body.* New York, 1930.

COCA, A. F. "Hypersensitiveness." *Practice of Medicine,* Vol. I, p. 107.

COCA, A. F., WALZER, M., and THOMMEN, A. A. *Hay Fever and Asthma in Theory and Practice.* 1931.

COMEL, MARCELLO. *Fisiologia normale e patologica della cute umana.* 2 Vols. Milano, 1933.

COPEMAN, W. S. C. *The Treatment of Rheumatism in General Practice.* London, 1933.

Council on Pharmacy and Chemistry. "Status of Certain Questions Concerning Vitamins." *Journal of the American Medical Association,* May 1, 1936, p. 1732.

CRAMP, A. J. "'Salts' and 'Crystals' Quackery." *Hygeia,* July, 1935, p. 617.

CRIEP, LEO H. *Essentials of Allergy.* J. B. Lippincott, Philadelphia, 1945.

DENNING, H. ET AL. "Acidosis—Effect upon Capacity for Work." *Journal of Clinical Investigations,* Feb., 1931, p. 601.

DOCHEZ, A. R. and HANZER, F. H., JR. "The Common Cold." *Oxford Medicine,* 1932, Chap. XXXI.

DUBOIS, DE SAUJON ROBERT. *L'Hydrotherapie medicale.* Paris, 1930.

EDDY, WALTER H., and DALLDORF, GILBERT. *The Avitaminoses.* New York, 1937.

EMERSON, HAVEN. *Alcohol and Man: Effects of Alcohol on Man in Health and Disease.* New York, 1932.

FINCK, HENRY T. *Food and Flavor.* New York and London, 1924.

FODOR, JULIUS. "On Sedative Hydrotherapy." *Archives of Medical Hydrotherapy,* May, 1924.

FRIEDENWALD, JULIUS. "Diseases of the Digestive System." Tice's *Practice of Medicine,* Vol. VII, Hagerstown, 1932.

FURNAS, C. C., and FURNAS, S. M. *Man, Bread and Destiny.* New York, 1937.

GAUGER, M. E. *Vitamins and Your Health.* New York, 1935.

GERSHENFELD, LOUIS. *Bacteriology and Sanitary Science.*

GILMOUR, A. J. "The Skin and Its Care." *International Journal of Medicine and Surgery,* May-June, 1934, p. 243.

GOLDMAN, L. "Patch Tests with Soap." *Bulletin of University of Cincinnati,* Nov., 1935.

GOODMAN, HERMAN. *Cosmetic Dermatology.* New York, 1936.

GRAHAM, STANLEY, and MORRIS, NOAH. *Acidosis and Alkalosis.* Edinburgh, 1933.

GRAVES, LULU G. *Foods in Health and Disease.* New York, 1932.

HAGGARD, HOWARD W. *What You Should Know About Health and Disease.* New York and London, 1928.

HAGGARD, H. W., and GREENBERG, L. A. *Diet and Physical Efficiency.* New Haven, 1935.

HALLIBURTON, W. D., and MCDOWELL, R. J. S. *Handbook of Physiology.* Philadelphia, 1934.

HARROW, BENJAMIN. *Vitamins, Essential Food Factors.* New York, 1921.

HARTSOCK, C. J. "Headache of Gastro-Intestinal Origin." *Cleveland Clinical,* July, 1935, p. 58.

HARWOOD, E. J., and NAYNER, R. B. *How to Train Your Body.* Boston, 1933.

HINSDALE, GUY. "Survey of Actual Value of Hydrotherapy." *Journal of the American Medical Association,* Aug. 13, 1927, p. 502.

HORNEBROOK, F. A. *The Culture of the Abdomen.* Garden City, 1933.

HURST, A. F. *Constipation and Allied Intestinal Disorders.* London, 1919.

JACOBS, MORRIS ed. *The Chemistry and Technology of Food and Food Products.* Interscience Publishers, Inc. New York, 1944, Vol. I, II.

KNOWLES, FRANK CROZIER. *Diseases of the Skin, Including Acute Eruptive Fevers.*

KOHN, L. WINFIELD. *Practical Treatise on Diseases of the Digestive System.* 2 Vols. Philadelphia, 1930.

KONIG, J. *Chemie der Menschlichen Narungs-und Genussmittel.* 7 Vols. Berlin, 1923.

KRUSEN, FRANK HAMMOND. "Colonic Irrigation." *Journal of the American Medical Association,* January 11, 1936, p. 118.

LAIRD, D. A., and MULLER, C. G. *Sleep; Why We Need It and How to Get It.* New York, 1930.

LONG, ET AL. "Colds due to Filtrable Virus." *Journal of Experimental Medicine.* April, 1931, p. 447.

MACCALLUM, W. G. *A Text Book of Pathology.* Philadelphia, 1934.

MACFADDEN, BERNARR. *Constipation—Its Causes, Effect and Treatment.* New York, 1932.

MACLEOD, J. J. R. *Physiology and Biochemistry in Modern Medicine.* 1922.

MAHLER, P. "Vergleichende Studien über Antacida." *Medicinische Klinik.* Nov. 16, 23, 1934.

MALMSTEAD, L. I. *Your Face and Your Figure.* Philadelphia, 1931.

McCollum, E. V., and Simmonds, N. *The New Knowledge of Nutrition.* New York, 1929.

Medical Research Council of Great Britain. *Vitamins: A Survey of Past and Present Knowledge.* Special Report No. 16, London, 1932.

Morgan, W. G. *Fundamental Disorders of the Gastro-Intestinal Tract.* Philadelphia and London, 1931.

Nutrition Dept., Quaker Oats Co. *Vitamin Summary and Cereal Food Fact,* 1944-45 Edition. The Quaker Oats Co., Chicago, Ill., 1944.

Olsen, Alfred B. "Effect of Liquid Petrolatum Given by Mouth on Digestion and Absorption of Food." *Journal of the American Medical Association,* July 6, 1928, p. 143.

Osler, Sir William. *Principle and Practice of Medicine.* (Thomas McCrae), New York, 1930.

Pearl, Raymond. *Alcohol and Longevity.* New York, 1926.

Percival, G. H. "Skin Problems and Dermatitis." Trans. Medical Clinics Society, *Edinburgh Medical Journal,* Nov., 1934, p. 177.

Plimmer, R. H. A. *Food, Health, Vitamins.* London, 1932.

Powell, Eric F. *Water Treatments, Plain and Medicated.* London, 1929.

Principles and Practice of Hydrotherapy. Ed. by Harry S. Mock et al. 3 Vols. Hagerstown, 1933.

Pusey, William A. *Care of the Skin and Hair.* New York, 1929.

Pusey, William A. *Principles and Practice of Dermatology.* New York, 1924.

Rademackers, A., and Sollmann, T. *Investigations on Saline Cathartics.* Chicago, 1924.

Rolleston, Sir H. D. and McNee, J. W. *Diseases of the Liver, Gall Bladder and Bile Ducts.* London, 1929.

Schmidt, C. L. A., and Greenberg, D. M. "Occurrence, Transport and Regulation of Calcium, Magnesium and Phosphorus." *Physiological Reviews,* 1935, p. 297.

Sherman, Henry C. *Chemistry of Food and Nutrition,* New York, 1937.

Sherman, Henry C. *The Vitamins.* New York, 1931.

Sippe, C. "Dangers of Indiscreet Alkaline Therapy." *Medical Journal of Australia,* April 20, 1936, p. 488.

Sollmann, Torald. *A Manual of Pharmacology and Its Applications to Therapeutics and Toxicology.* Philadelphia and London, 1932.

Starling, Ernest H. *The Action of Alcohol on Man.* London, 1923.

Stengel, Alfred. "Diseases of the Intestines." Osler's *Modern Medicine*. Vol. III, Chap. X. Philadelphia and New York, 1926.

Sulzberger, M. B., and Rosenberg, A. "Practical Procedures in the Investigation of Allergic Dermatitis." *Journal of Allergy*, July, 1935, p. 448.

Sure, Barnett. *The Vitamines in Health and Disease*. New York, 1933.

Swartz, J. H., and Reilly, M. G. *Diagnosis and Treatment of Skin Diseases, Including the Care of the Normal Skin.*

United States Public Health Report, July 13, 1934. *Distribution of Common Colds and Its Relation to Corresponding Weather Conditions.*

Vaughn, W. T. *Allergy and Applied Immunology*. St. Louis, 1934.

Weiss, Edward, and English O. Spurgeon. *Psychosomatic Medicine*. W. B. Saunders Co., Philadelphia, 1943.

White, Robert Prosser. *The Dermatergoses or Occupational Affections of the Skin*. New York, 1934.

Winton, A. L., and Winton, K. B. *The Structure and Composition of Foods*. Vol. I. New York, 1932.

Wyatt, Bernard L. *Chronic Arthritis and Fibrositis; Diagnosis and Treatment,* Baltimore, 1933.